Federal Debt and Interest Costs

Special Study

September 1984

CONGRESS OF THE UNITED STATES CONGRESSIONAL BUDGET OFFICE

J932-27

FEDERAL DEBT AND INTEREST COSTS

The Congress of the United States
Congressional Budget Office

NOTES

The baseline budget projections for fiscal years 1984 to 1989 contained in this paper are consistent with the totals shown in Congressional Budget Office, An Analysis of the President's Budgetary Proposals for Fiscal Year 1985 (February 1984). These projections assume the continuation of taxing and spending policies in place at that time, including the carrying out of any future policy changes (such as tax indexing) already enacted into law. For further information on the baseline concept, and a description of the economic assumptions used, see Congressional Budget Office, Baseline Budget Projections for Fiscal Years 1985-1989 (February 1984).

This paper also discusses updated projections prepared in summer 1984 and published in Congressional Budget Office, The Economic and Budget Outlook: An Update (August 1984).

Unless otherwise noted, all years referred to in this paper are fiscal years. Details in the text and tables may not add to totals as a result of rounding.

PREFACE

Reliable estimates of federal spending and revenues, and a clear understanding of their dynamics, are important to the federal budget process. The Congressional Budget Office (CBO) has developed methods for generating budget estimates under a variety of economic and policy assumptions. The CBO publishes analyses of its estimating methods and of current budgetary issues so that those outside the agency may evaluate CBO's techniques and estimates. This paper provides such analysis for federal debt and interest costs, which are growing rapidly during the 1980s.

Kathy A. Ruffing and Charles J. Richardson of the Projections Unit, Budget Analysis Division, prepared this study under the supervision of Paul N. Van de Water and James L. Blum. Miss Ruffing is the principal author, while Mr. Richardson is responsible for the projections and analysis of Other Interest. Debb Kalcevic of CBO's Budget Analysis Division and Valerie Amerkhail of the Tax Analysis Division contributed to several of the simulations. Barry Bosworth, Robert Hartman, Skip Haworth, and Darwin Johnson provided valuable comments on earlier drafts. Paul L. Houts edited the manuscript, assisted by Nancy H. Brooks. Sherri McLain typed the numerous drafts.

An earlier version of this paper was presented at the Annual Meeting of the American Economic Association in San Francisco, California, December 30, 1983.

Rudolph G. Penner
Director

September 1984

CONTENTS

		Page
PREFACE		iii
SUMMARY		xv
	Dynamics of the Debt and Interest	xvi
	Projecting Interest Costs	xviii
	The CBO February and August Baselines	xix
	Further Research	xix
CHAPTER I.	DETERMINANTS OF FEDERAL DEBT AND INTEREST COSTS	1
	Ownership of Federal Debt	1
	Debt Held by the Public	1
	Debt Held by Government Accounts	5
	Types of Debt Securities	7
	Seasonal Patterns of Federal Borrowing	12
CHAPTER II.	SIMULATIONS WITH THE CBO INTEREST MODEL	15
	Baseline Interest Projections	16
	Effect of Higher Interest Rates	20
	One-Percent Higher Interest Rates, 1984-1989	21
	Alternative Interest Rate Assumptions	23
	Effect of Higher Deficits	25
	Effect of a Change in Financing Mix: Savings Bonds Versus Marketables	27
	Updating the Interest Projections: The CBO August Baseline	30
APPENDIX.	TECHNICAL FEATURES OF THE CBO INTEREST MODEL	37
	Interest on Public Issues	37
	Annual and Monthly Financing	37
	Bills	39
	Notes and Bonds	40
	An Illustration: Marketable Interest Costs in February 1984	41
	Analysis of Errors in Marketable Interest Projections, 1983	43

CONTENTS (continued)

	Page
Notes and Bonds	40
An Illustration: Marketable Interest Costs in February 1984	41
Analysis of Errors in Marketable Interest Projections, 1983	43
Savings Bonds	46
State and Local Government Series	46
Foreign Series	47
Adjusting Interest Costs on Public Issues for Alternative Deficits	48
Interest on the Government Account Series and Interest Received by Trust Funds	49
Change in Debt Holdings	50
Interest Outlays	51
Other Interest	51
Interest from Off-budget Agencies	52
Interest on IRS Refunds	54
Interest on Tax and Loan Accounts	55
Treasury Intragovernmental Interest	56
Interest Received from Outer Continental Shelf Escrow Accounts	57
Interest on Unemployment Insurance Loans to States	57
Treasury Proprietary Interest	58

FIGURES

		Page
SUMMARY FIGURE 1.	DEBT HELD BY THE PUBLIC	xv
SUMMARY FIGURE 2.	DEBT HELD BY THE PUBLIC AS A PERCENTAGE OF GNP	xvi
SUMMARY FIGURE 3.	FEDERAL NET INTEREST PAYMENTS	xvii
FIGURE 1.	AVERAGE LENGTH OF MARKETABLE DEBT HELD BY PRIVATE INVESTORS	11

TABLES

		Page
TABLE 1.	ACTUAL AND PROJECTED FEDERAL DEBT, 1980-1989, FEBRUARY BASELINE	2
TABLE 2.	ACTUAL AND PROJECTED DEFICITS AND FEDERAL GOVERNMENT BORROWING, 1980-1989, FEBRUARY BASELINE	4
TABLE 3.	CALENDAR OF TREASURY ISSUES OF MARKETABLE DEBT	8
TABLE 4.	INTEREST-BEARING PUBLIC DEBT (MARKETABLE AND NON-MARKETABLE), SEPTEMBER 30, 1983	9
TABLE 5.	MATURITY DISTRIBUTION OF THE MARKETABLE DEBT, SEPTEMBER 30, 1983 ...	10
TABLE 6.	DEFICITS AND MEANS OF FINANCING, 1980-1983	13
TABLE 7.	FEBRUARY BASELINE NET INTEREST PROJECTIONS, 1984-1989	16
TABLE 8.	FEBRUARY BASELINE INTEREST RATE ASSUMPTIONS ON NEW BORROWING (SELECTED MATURITIES), 1984-1989	17
TABLE 9.	GROWTH IN OUTLAYS FOR NET INTEREST ON THE PUBLIC DEBT, 1984-1989, FEBRUARY BASELINE	19
TABLE 10.	EFFECT ON FEBRUARY BASELINE PROJECTIONS OF ONE PERCENT HIGHER INTEREST RATES, 1984-1989	22
TABLE 11.	EFFECT OF ALTERNATIVE INTEREST RATE SCENARIOS ON FEBRUARY BASELINE PROJECTIONS, 1984-1989	24

38-555 O - 84 - 2

TABLES (continued)

		Page
TABLE 12.	EFFECT OF $10 BILLION ADDITIONAL BORROWING ON FEBRUARY BASELINE PROJECTIONS, 1984-1989	25
TABLE 13.	SALES, REDEMPTIONS, AND INTEREST INCREMENTS OF U.S. SAVINGS AND RETIREMENT PLAN SERIES, 1980-1983	28
TABLE 14.	SCHEDULE OF INTEREST RATES ON SAVINGS BONDS SOLD ON OR AFTER NOVEMBER 1, 1982	29
TABLE 15.	EFFECT OF $5 BILLION HIGHER SAVINGS BOND SALES ON FEBRUARY BASELINE NET INTEREST COSTS, 1984-1989	30
TABLE 16.	CHANGE IN NET INTEREST PROJECTIONS BETWEEN FEBRUARY AND AUGUST 1984 BASELINES, 1984-1989	32
TABLE 17.	AUGUST BASELINE INTEREST RATE ASSUMPTIONS ON NEW BORROWING (SELECTED MATURITIES), 1984-1989	33

APPENDIX TABLES

		Page
TABLE A-1.	SEASONAL FACTORS FOR MARKETABLE BORROWING ASSUMED IN BASELINE	38
TABLE A-2.	PROJECTED INTEREST OUTLAYS ON MARKETABLE ISSUES, FEBRUARY 1984	42
TABLE A-3.	PROJECTED VERSUS ACTUAL INTEREST OUTLAYS ON MARKETABLE DEBT, 1983	45
TABLE A-4.	MAJOR GOVERNMENT ACCOUNTS INVESTING IN FEDERAL DEBT	50
TABLE A-5.	FEDERAL FINANCING BANK HOLDINGS, SEPTEMBER 30, 1983	53

BOXES

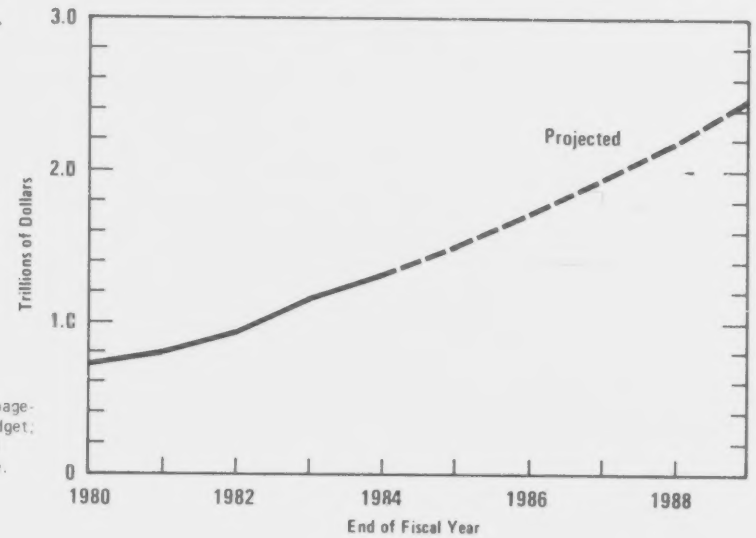
	Page
A DEBT DICTIONARY	3
THE IMF AND FEDERAL BORROWING	6
NET INTEREST IN THE NATIONAL INCOME AND PRODUCT ACCOUNTS	18

SUMMARY

The combination of large budget deficits and high interest rates during the 1980s is causing federal debt and interest costs to rise rapidly. Under the Congressional Budget Office's (CBO's) latest baseline projections, reflecting the policies in effect in mid-1984, federal debt held by the public will reach almost $2.5 trillion in fiscal year 1989. Between 1983 and 1989, as shown in Figure 1, the debt will more than double under these projections.

CBO's projections also show the debt growing significantly relative to the size of the U.S. economy (see Figure 2). As a percent of gross national product (GNP), the debt held by the public would climb to 46 percent by the end of the decade from its current level of 35 percent, assuming that current government policies are not changed. In contrast, debt held by the public represented 25 percent to 29 percent of GNP during the early and mid-1970s--a ratio that had fallen steadily from its World War II peak.

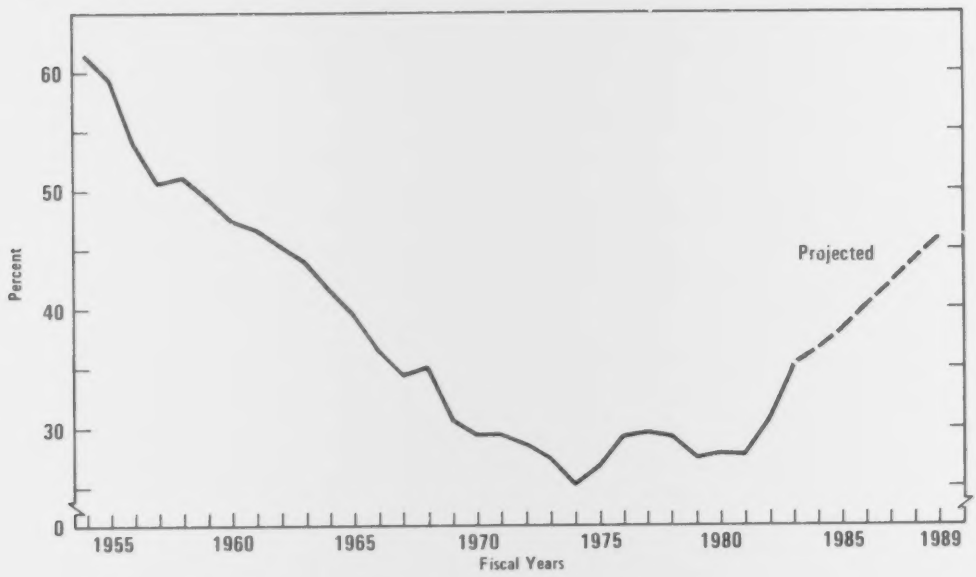
Summary Figure 1.
Debt Held by the Public



SOURCES: Office of Management and Budget; Congressional Budget Office.

Summary Figure 2.

Federal Debt Held by the Public as a Percentage of GNP



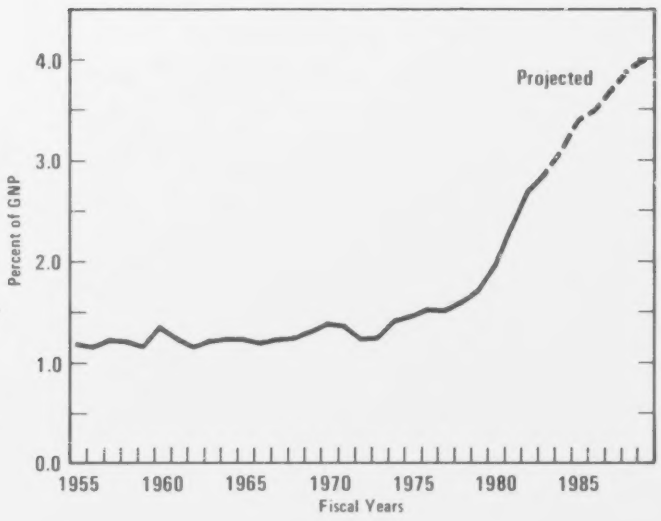
SOURCE: Congressional Budget Office.

Because of the growth of the debt and high nominal interest rates, net interest costs are currently the fastest-growing part of the federal budget. During most of the 1960s and 1970s, net interest represented about 7 percent of total budget outlays and less than 2 percent of GNP. In contrast, net interest outlays in fiscal year 1983 totaled $90 billion, or 11 percent of total outlays. By fiscal year 1989, they are expected to be about $214 billion, or 16 percent of total outlays under CBO's latest projections. As a share of GNP, interest outlays are projected to grow from about 3 percent at present to 4 percent by 1989 (see Figure 3).

DYNAMICS OF THE DEBT AND INTEREST

This paper discusses the dynamics of the federal debt and describes the relationship of interest costs to the size and turnover of the debt. It also describes the factors that determine the size of the debt and discusses how CBO projects debt levels that are consistent with its overall budget estimates. When discussing the federal debt, a bewildering variety of labels --and figures--must be cited. For example, the reader may see figures for

Summary Figure 3.
Federal Net Interest Payments



SOURCES: Office of Management and Budget; Congressional Budget Office.

the end-of-1983 federal debt ranging from $986 billion to $1,382 billion, depending on the particular definition used. These discrepancies arise because the federal debt is held by several disparate groups--private investors, the Federal Reserve System, and federal government trust funds and other special funds. The budgetary and economic impacts of the federal debt differ depending on its ownership. The federal debt held by the public--which represents cumulative federal government borrowing over the years--is the measure most closely related to federal government net interest costs.

The annual growth in the debt held by the public can be projected based on three major determinants: the unified (or on-budget) deficit, the off-budget deficit, and means of financing other than borrowing (such as temporary reductions in cash balances). Means of financing other than borrowing can be important in the short run but have little effect over longer periods. Ultimately, the government must finance deficits by borrowing. (Chapter I shows how deficits have caused the debt's growth over the past several years, and presents projections showing annual borrowing of approximately $200 billion or more for the remainder of the decade.)

38-555 0 - 84 - 3

To finance the deficit, the federal government borrows primarily by selling marketable securities--bills, notes, and bonds--at auction. The Treasury Department schedules auctions to refinance maturing securities and raise new cash according to anticipated needs. While the new cash needs of the Treasury are currently about $200 billion annually, an even larger amount of debt--about $1 trillion annually--must be auctioned in order to refinance maturing debt. This refinancing of existing debt at new interest rates is a critical determinant of federal government net interest costs. Treasury borrowing also has a pronounced seasonal pattern, stemming in part from the underlying seasonality of revenues and outlays and in part from efforts to increase (or draw down) federal government cash balances during certain periods.

PROJECTING INTEREST COSTS

Net interest outlays consist of the government's interest payments on its borrowing and, as offsets, various interest receipts--for example, interest income on loans extended by the federal government. In projecting federal government net interest outlays, CBO's model uses projected debt levels, interest rates, and other assumptions (such as financing mix and seasonal borrowing patterns). The net interest projections developed by CBO in early 1984 assumed the continuation of tax and spending policies in place at that time. These February baseline projections showed that annual interest costs would approximately double by the end of the decade--from an estimated $110 billion in 1984 to $217 billion in 1989.

These projections would differ dramatically, however, under different assumptions about the economy or tax and spending policies. Any budget projections are extraordinarily sensitive to assumptions about future interest rates. The existing debt and the volume of new borrowing are so large that a relatively small forecasting error can easily result in a cumulative error amounting to tens of billions of dollars over several years of budget projections. Underestimating all interest rates by just one percentage point during the entire 1984-1989 period, for example, would have caused an underestimation of CBO's February net interest projections of about $2 billion in 1984, which would have grown to $30 billion in 1989.

Uncertainty about future deficits also creates a wide range for interest cost projections. Reducing revenues or increasing non-interest spending by $10 billion in each year would have caused the baseline interest outlays to be higher by $0.4 billion in 1984, growing to $7.2 billion in 1989. By the same token, actions to reduce the deficit by increasing revenues or limiting non-interest spending would lead to a bonus in the form of lower

interest outlays. This link suggests that the current debates about defense spending, tax policy, entitlement reforms, and other budget issues all carry implications for future levels of federal debt and interest costs.

THE CBO FEBRUARY AND AUGUST BASELINES

In February 1984, CBO published baseline budget projections that showed budget deficits growing from an estimated $189 billion in 1984 to $308 billion in 1989 under the policies in place at that time. Legislative and economic developments in early 1984, however, have changed the budget picture for 1984 and beyond. The Congress passed several measures--most notably the Deficit Reduction Act of 1984--designed to reduce budget deficits in future years. In addition, economic growth in the first half of 1984 exceeded CBO's projection, while at the same time, a sharp climb in interest rates increased the Treasury's borrowing costs.

CBO's August 1984 baseline reflects these policy changes and new economic assumptions. The August estimates show considerable progress in moving the federal government to a lower deficit path--from an estimated $172 billion in 1984 to $263 billion in 1989, assuming the continuation of current policies. Relative to the size of the economy, these deficits remain virtually flat at just under 5 percent of GNP.

Compared to the February estimates, CBO's August projections for net interest costs present a mixed picture. The new estimates show higher interest outlays in 1984 through 1988 before the effects of lower deficits and other revisions finally outweigh the higher interest rate forecast for 1989. CBO estimates that this year's Congressional actions will save almost $16 billion in net interest costs in 1989 relative to the policies assumed in February. Though partially offset by a higher interest rate forecast, these savings do represent a substantial, and permanent, reduction in the government's costs.

In describing the dynamics of federal debt and interest costs, this paper focuses primarily on CBO's February estimates. It concludes with a description of the changes in CBO's net interest projections between February and August--changes resulting from Congressional initiatives, economic developments, and other factors.

FURTHER RESEARCH

Because of recent and projected growth in federal debt and interest costs, more and more attention is being focused on the dynamics and the

economic effects of this fast-growing area of the federal budget. For example, a number of researchers are currently working to develop long-run federal budget projections using various assumptions about real growth, inflation, interest rates, and tax and spending policy. CBO itself is working on a streamlined version of its interest model to address this and other questions.

CHAPTER I. DETERMINANTS OF FEDERAL DEBT AND INTEREST COSTS

Federal government interest costs equal the amount of federal debt times the average interest rate on the debt. The challenge in estimating interest costs is to project these simple determinants in a technically and economically consistent manner. CBO estimates future debt levels that are consistent with its budget projections. CBO's interest projections depend on the characteristics of the publicly held federal debt such as interest rates, the maturity structure, and the seasonal pattern of borrowing.

OWNERSHIP OF FEDERAL DEBT

Federal debt contains several components. The debt held by the public reflects cumulative federal government borrowing over the years and is the measure most closely related to federal government net interest costs. Two more familiar measures--the gross public debt and its close relative, debt subject to statutory limit--include very large holdings of federal debt by the federal government itself. (See accompanying box of definitions.)

Debt Held by the Public

Federal debt held by the public reflects cumulative federal borrowing. It is important to keep in mind that the public includes all holders of government securities outside the federal government itself. It encompasses such disparate investors as banks, insurance companies, state and local governments, individual investors, and others. In addition, the Federal Reserve System, which buys and sells securities in order to conduct monetary policy, as well as foreign governmental and private purchasers of securities, are also included in the public. At the end of 1983, debt held by the public totaled over $1.1 trillion, and under CBO's baseline assumptions it is projected to more than double by 1989. Table 1 shows the broad division of the federal debt into debt held by the public and debt held by government accounts.

Although it fulfills a quasi-governmental function, the Federal Reserve System is statutorily independent and is included in the public. The Federal Reserve purchases and sells securities in the secondary (resale) market as a major tool for conducting monetary policy. Through such open

TABLE 1. ACTUAL AND PROJECTED FEDERAL DEBT, 1980-1989, FEBRUARY BASELINE (In billions of dollars)

Fiscal Years	Held by Public			Held by Government Accounts	Total	Debt Subject to Statutory Limit
	Federal Reserve	Other	Subtotal			
			Actual			
1980	121	594	715	199	914	909
1981	124	670	794	210	1,004	999
1982	134	795	929	218	1,147	1,143
1983	156	986	1,142	240	1,382	1,378
			Projected			
1984	a/	a/	1,330	270	1,600	1,596
1985	a/	a/	1,539	320	1,859	1,855
1986	a/	a/	1,770	379	2,148	2,144
1987	a/	a/	2,029	445	2,474	2,470
1988	a/	a/	2,316	530	2,846	2,842
1989	a/	a/	2,638	628	3,266	3,263

SOURCES: U.S. Department of the Treasury; Congressional Budget Office.

a. Not available.

market operations, the Federal Reserve adds to the money supply by purchasing securities and reduces it by selling securities. The bulk of interest earned on the Federal Reserve's holdings, after administrative expenses have been deducted, is returned to the Treasury and counted as a miscellaneous receipt in the budget. In fiscal year 1983, deposits of earnings by the Federal Reserve totaled over $14 billion.

Federal government deficits, both on- and off-budget, are the primary reason for borrowing from the public. The unified or on-budget deficit is the measure commonly used by press and public; it includes all federal

A DEBT DICTIONARY

A confusing array of labels is attached to the seemingly simple concept of the federal debt. Similar-sounding names are applied to figures that may differ by several hundred billions of dollars. The definitions of federal debt used in this paper and elsewhere are as follows:

Gross federal debt is the broadest measure of federal debt. It consists of the entire public (Treasury) debt as well as a small amount of debt issued by other agencies, such as the Tennessee Valley Authority. At the end of fiscal year 1983, the gross federal debt stood at $1,381.9 billion: $1,377.2 billion in public debt and $4.7 billion in agency debt. The gross federal debt is further divided according to its ownership between:

> Debt held by the public, which represents all holdings of federal debt by nongovernmental investors (including the Federal Reserve System). At the end of 1983, the public held $1,138.2 billion of public debt and $3.6 billion of agency debt, for a total of $1,141.8 billion.
>
> Debt held by government accounts, which represents holdings of debt by federal government trust funds and other special funds. At the end of 1983, debt held by government accounts totaled $240.1 billion: $239.0 billion in public debt and $1.1 billion in agency debt.

Public debt--not to be confused with debt held by the public--is simply debt issued by the Treasury Department. At one time, other federal agencies issued their own special debt securities, but this practice is now negligible. At the end of 1983, the public debt stood at $1,377.2 billion.

Debt subject to statutory limit is the figure voted by Congress when raising the federal government's debt-issuance authority. It differs from the gross federal debt because a small amount of public debt and the bulk of agency debt are not counted under the statutory limit. At the end of 1983, the debt subject to limit was $1,378.0 billion.

TABLE 2. ACTUAL AND PROJECTED DEFICITS AND FEDERAL GOVERNMENT BORROWING, 1980-1989, FEBRUARY BASELINE (In billions of dollars)

Fiscal Year	Deficits			Means of Financing		Debt Held by Public
	On-Budget	Off-Budget	Total	Total Borrowing	Other[a]	
			Actual			
1980	60	14	74	71	3	715
1981	58	21	79	79	b	794
1982	111	17	128	135	-7	929
1983	195	12	208	212	-5	1,142
			Projected			
1984	189	15	205	188	17	1,330
1985	197	15	212	210	2	1,539
1986	217	14	231	230	1	1,770
1987	245	15	261	260	1	2,029
1988	272	16	288	287	1	2,316
1989	308	15	323	322	1	2,638

SOURCES: U.S. Department of the Treasury; Congressional Budget Office.

a. Reduction in cash balances, change in checks outstanding, and so forth. Minus sign indicates that these factors contributed to higher borrowing requirements.

b. Less than $500 million.

government revenues and most spending programs. The off-budget deficit reflects certain outlays that are, by law, excluded from the unified budget. While off-budget spending includes outlays for the Strategic Petroleum Reserve and the Postal Service, the bulk of off-budget outlays consists of loans made by the Treasury Department's Federal Financing Bank (FFB). Since these loans add to federal government assets as well as its debt, they

generate interest income to the federal government in future years and affect interest costs only negligibly on a net basis.[1/] Table 2 shows how on- and off-budget deficits and other factors determine the government's borrowing needs.

In addition to on- and off-budget deficits, a number of factors broadly labeled "other means of financing" affect the federal government's need to borrow from the public. These include reductions (or increases) in the government's cash balances, changes in checks outstanding, changes in accrued interest costs included in budget outlays but not yet paid, and other changes. (Transactions with the IMF can be an important component of "other means" and are described in the accompanying box.) While these factors may be important in the short run, they generally are not in the long run. Reductions in cash balances, for example, soon reach a limit, and the balances themselves result from previous borrowing.

CBO projections of total borrowing from the public are consistent with its projections of revenues, outlays, and off-budget spending. It makes detailed projections of other means of financing besides borrowing for the current fiscal year. With rare exceptions, little basis exists for projecting the other means of financing beyond the current year; therefore, CBO makes assumptions based on historical experience.

Debt Held by Government Accounts

The gross federal debt includes very substantial holdings by the federal government itself. Most of these are holdings of federal government trust funds (such as the various social insurance trust funds and the airport and highway funds). A much smaller amount is held by other types of funds (for example, an escrow fund set up to hold receipts from offshore oil tracts that are currently the subject of litigation between the federal government and the states). These government accounts generally invest any surpluses of receipts over expenditures in interest-bearing public debt securities specially issued by the Treasury Department and not available to the public.

---

1. Off-budget lending by the FFB does have a small impact on net interest costs for two reasons. First, the FFB lends almost entirely at medium- and long-term maturities, with rates pegged to the comparable Treasury rate plus one-eighth percentage point. The Treasury borrows in all maturity sectors--short, medium, and long. Second, public debt interest is counted on an accrual basis in the budget, while interest receipts from the FFB are reported on a cash basis.

38-555 O - 84 - 4

THE IMF AND FEDERAL BORROWING

The U.S. government's recent participation in efforts to relieve the international debt problem has focused attention on the budgetary implications of U.S. transactions with the International Monetary Fund (IMF). Money advanced to other countries through the IMF does not directly affect budgetary outlays or the deficit, but it can affect the timing of the U.S. government's borrowing requirements. When the IMF calls on the U.S. to advance funds under its commitment, the U.S. government must obtain the funds by borrowing or by drawing down its assets. The United States, in turn, earns interest on its IMF quota and on loans to the IMF. As the IMF loans are subsequently repaid, Treasury cash flow is enhanced and its borrowing requirements temporarily diminished.

When the United States tranfers funds to the IMF, it is credited with an increase in its own reserve position--a liquid international monetary asset that is available unconditionally to the United States in case of balance of payments need. Since these transactions are considered to reflect exchanges of financial assets, they are not counted as budget outlays and do not affect the deficit. These flows can, however, be an important component of the "other means of financing" that affect the debt.

IMF loans and repayments do have a small indirect effect on budgetary outlays through their associated interest costs and receipts. The timing of interest income from loans to the IMF tends to lag behind the federal government's obligation for interest payments on its own additional borrowing. In addition, IMF payments to lending countries are pegged to an average of the largest member countries' rates. In recent years, U.S. interest rates have been higher than those of other developed countries; as a result, interest income from IMF loans is somewhat less than the additional interest costs on Treasury borrowing. The Treasury recently estimated that additional net interest costs associated with IMF transactions averaged about $42 million annually during the 1970-1982 period.

As shown in Table 1, government account holdings of federal debt totaled about $240 billion at the end of 1983.

The Civil Service Retirement Trust Fund held close to half ($110 billion) of all government account holdings of federal debt at the end of 1983. The remainder was accounted for by a number of funds, with major holdings credited to the Social Security and Medicare trust funds ($51 billion), the airport and highway trust funds ($14 billion), the Federal Deposit Insurance Corporation fund ($14 billion), the unemployment insurance trust fund ($8 billion), and others. CBO's projections of government account holdings of federal debt are consistent with its estimates of these funds' income and expenditures. For example, it projects a large increase in government account holdings of federal debt in 1985 and subsequent years, as a result of recent legislation creating a military retirement trust fund beginning in 1985. Since the interest flows generated by government account holdings of federal debt are intragovernmental, they do not affect the government's net interest costs.

TYPES OF DEBT SECURITIES

The government borrows from the public primarily through the sale of securities at auction. These marketable securities consist of bills (original maturity of one year or less), notes (original maturity up to ten years), and bonds (original maturity of more than ten years). Bills are offered on a discount basis--that is, the purchaser pays a certain price for the security and receives a larger amount (the face amount) at maturity. In contrast, notes and bonds are coupon securities; the purchaser receives semi-annual interest payments and gets back the principal at maturity. The Treasury Department schedules auctions according to anticipated cash needs. It auctions three-and six-month bills weekly, and one-year bills every four weeks. Cash management bills are auctioned irregularly. Note and bond auctions follow a complex schedule with auctions clustered in the middle and last months of the quarter (often called the mid-quarter and end-of-quarter refundings). Once auctioned, securities are actively traded in the secondary market both before and after actual issue. Table 3 summarizes a typical calendar for Treasury issues of marketable debt.

The Treasury Department conducts a much smaller volume of borrowing by issuing nonmarketable securities. "Nonmarketable" simply means that these securities are not sold at auction and cannot be traded in the secondary market. The familiar savings bond is the most important of these nonmarketable securities. In recent years, redemptions of savings bonds have exceeded cash sales, probably because of the greater availability of competitive money market instruments with few restrictions. Beginning in late 1982, however, the Treasury Department switched to selling market-

TABLE 3. CALENDAR OF TREASURY ISSUES OF MARKETABLE DEBT

Type of Issue	Issues Per Year	Timing
91-Day Bills	52	Weekly on Thursdays
182-Day Bills	52	Weekly on Thursdays
364-Day Bills	13	Every Fourth Thursday
Cash Management Bills	Variable	As Needed to Bridge Low Cash Balances
Two-Year Notes	12	End of Each Month
Three-Year Notes	Four	Mid-Quarter Refunding
Four-Year Notes	Four	Last Month of Quarter (End-of-Quarter Refunding)
Five-Year, Two-Month Notes	Four	Early in Third Month of Quarter
Seven-Year Notes	Four	Early in First Month of Quarter (End-of-Quarter Refunding)
Ten-Year Notes	Four	Mid-Quarter Refunding
20-Year Bonds	Four	Early in First Month of Quarter (End-of-Quarter Refunding)
30-Year Bonds	Four	Mid-Quarter Refunding

SOURCE: Congressional Budget Office, based on Treasury Department information.

NOTE: This calendar reflects Treasury debt management practices of the past several years. Actual calendars may differ because of such factors as the timing of weekends and holidays, debt ceiling interruptions, and variations in Treasury cash balances. Auctions are generally conducted two to ten days before issue dates. For example, the end-of-quarter mini-refunding generally includes two issues that settle in the following month.

based savings bonds with returns pegged to competitive market rates on medium-term Treasury securities. To qualify, the buyer must hold the savings bond for five years or longer. Preliminary data suggest that the trend of net redemptions of savings bonds has slowed but not stopped. The Treasury also borrows from the public by issuing special securities to state and local as well as foreign governments.

At over $1 trillion, marketable debt represents almost three-fourths of total interest-bearing public debt and almost 90 percent of public issues (public debt excluding the government accounts series). Table 4 summarizes the total interest-bearing public debt at the end of fiscal year 1983 by maturity and interest rate.

TABLE 4. INTEREST-BEARING PUBLIC DEBT (MARKETABLE AND NON-MARKETABLE), SEPTEMBER 30, 1983

Type of Issue	Amount Outstanding (In billions of dollars)	Average Interest Rate (In percents)
Marketable		
Bills	340.7	9.6
Notes	557.5	11.7
Bonds	125.7	10.3
Subtotal	1,024.0	10.8
Nonmarketable		
Savings Bonds	70.0	7.1
Foreign Series	11.4	8.7
State and Local Government Series	35.1	8.2
Government Accounts Series[a/]	234.7	10.5
Other	0.5	6.3
Subtotal	351.8	9.5
Total	1,375.8	10.5

SOURCE: Department of the Treasury.

a. Not sold to the public.

In projecting interest costs, CBO generally assumes that future borrowing requirements will be met by the sale of bills, notes, and bonds at auction. It modifies this assumption, however, if information becomes available suggesting net sales or redemptions of nonmarketable debt.

Refinancing the existing debt critically affects net interest costs. While Table 4 characterizes the debt by original maturity, the remaining maturity--the period until refinancing--can range from one day to several decades. Even during the current era of high deficits, refinancing of existing Treasury debt overshadows new borrowing. During fiscal year 1983, for example, gross issues of marketable debt totaled just over $1 trillion, while the net increase in marketable debt was only about $200 billion. Close to half of the marketable debt outstanding at the end of 1983 was scheduled for rollover at least once during the following year, as shown in Table 5. The remaining marketable debt, however, was not subject to rollover for up to 30 years. These characteristics of the debt indicate that prevailing market rates are a key influence on the government's interest costs during any period except the very short term, but that the effects of previous years' high (or low) interest rates can also continue to affect interest costs for years to come.

TABLE 5. MATURITY DISTRIBUTION OF THE MARKETABLE DEBT, SEPTEMBER 30, 1983 (In billions of dollars)

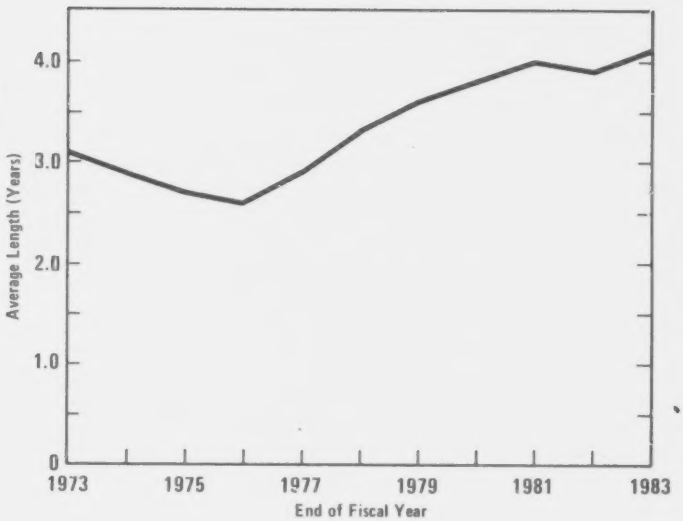
Type and Initial Maturity	Remaining Years to Maturity					Total
	One or Less	One to Three	Three to Six	Six to Ten	More than Ten	
Bills (One year or less)	340.7	a/	a/	a/	a/	340.7
Notes (Two-to-ten years)	122.7	241.1	116.8	76.9	a/	557.5
Bonds (More than ten years)	2.2	1.1	1.2	11.5	109.8	125.7
Total	465.6	242.2	118.0	88.4	109.8	1,024.0

SOURCE: Congressional Budget Office, based on Treasury Department information.

a. None.

Figure 1.

Average Length of Marketable Debt Held by Private Investors



SOURCE: Department of the Treasury.

The Treasury Department calculates that the average remaining maturity of the privately held marketable debt at the end of 1983 was just over four years, as shown in Figure 1. The mean is greater than the median of just over one year, as calculated from Table 5, because of the existence of bonds with maturities of up to 30 years.

As Figure 1 shows, the average maturity of the marketable debt has been rising since fiscal year 1976, when at one point it hit a low of two years and five months. The Treasury is currently trying to lengthen the average maturity of the debt by placing greater reliance on note and bond financing.[2/] By this strategy, it attempts to reduce the administrative burden and market disruption caused by frequent auctions to refund maturing issues, thus lessening the refinancing task implied by Table 5.

---

2. See, for example, the testimony of Thomas J. Healey, Assistant Treasury Secretary for Domestic Finance, before the Subcommittee on Taxation and Debt Management of the Senate Finance Committee, 98:2 (April 12, 1984).

TABLE 6. DEFICITS AND MEANS OF FINANCING, 1980-1983
(In billions of dollars)

Fiscal Year and Quarter	Deficits			Means of Financing		
	On-Budget[a]	Off-Budget	Total	Total Borrowing[b]	Reduction in Cash	Other[c]
1980: I	24.5	1.0	25.4	19.0	8.3	-1.8
II	26.8	3.9	30.7	19.1	7.8	3.9
III	-8.1	4.4	-3.7	5.4	-5.9	-3.1
IV	16.3	5.0	21.3	27.1	-6.9	1.1
	59.6	14.2	73.8	70.5	3.2	0.1
1981: I	33.6	2.1	35.7	27.7	8.7	-0.6
II	32.1	6.4	38.4	35.8	1.6	1.0
III	-16.2	5.5	-10.7	-2.6	-5.7	-2.4
IV	8.6	6.9	15.5	18.5	-2.3	-0.7
	57.9	21.0	78.9	79.3	2.3	-2.7
1982: I	48.2	3.6	51.8	35.6	6.6	9.5
II	23.7	2.0	25.7	32.8	-1.0	-6.1
III	2.5	5.8	8.3	9.0	2.0	-2.7
IV	36.2	6.0	42.3	57.6	-18.2	2.9
	110.6	17.3	127.9	134.9	-10.5	3.6
1983: I	68.3	1.1	69.4	62.0	9.4	-2.0
II	61.0	1.6	62.6	55.6	4.3	2.6
III	29.2	4.3	33.5	46.9	-12.5	-0.8
IV	36.9	5.3	42.2	47.8	-9.1	3.4
	195.4	12.4	207.8	212.4	-7.9	3.2

SOURCE: Congressional Budget Office, based on Treasury Department information.

a. Minus sign denotes surplus.

b. Minus sign denotes net redemptions of federal debt.

c. Change in checks outstanding, change in interest accrued but not paid, and so forth.

The Treasury's choice of a marketable financing mix does, of course, affect interest costs. When the interest rate yield curve is positively sloped, with long-term interest rates higher than short-term rates, interest costs on a longer-term note or bond exceed the costs on a shorter-term instrument. The Treasury, however, must balance a number of considerations besides simple short-run interest cost minimization in planning its financing strategy. These considerations include the market's capacity to absorb huge weekly auctions (already over $13 billion a week) of short-term debt, as well as the change in interest rates that would result if Treasury drastically shifted its financing mix.

The Treasury is currently studying a number of innovative financing techniques to reduce its interest costs. Several options might make Treasury securities more attractive to foreign investors. Other suggestions would involve entirely new types of Treasury securities, such as zero-coupon bonds, bonds indexed to the inflation rate, and floating-rate securities. Because of the magnitude of Treasury's financing task, any successful innovations could conceivably shave millions of dollars from the government's interest bill.

SEASONAL PATTERNS OF FEDERAL BORROWING

Federal borrowing has a pronounced seasonal pattern, though in recent years it has been masked somewhat by major fiscal policy changes (such as tax cuts) and changes in economic conditions. The typical seasonal pattern of government financing can also be distorted if the Congress fails to approve a higher public debt ceiling sufficiently in advance to avoid disrupting Treasury auctions. Table 6 shows the quarterly pattern of federal borrowing during the past several fiscal years. Typically, the government has borrowed heavily and reduced cash balances during the first two quarters of the fiscal year (October through December and January through March); slowed down the pace of borrowing during the third quarter (April through June) as revenues peaked; then stepped up borrowing again while continuing to build up cash balances during the final fiscal quarter (July through September). The seasonal assumptions that CBO uses are essentially based on historical averages, with particular weight given to the high-deficit years of 1982 and 1983, and with adjustment for the apparent path of borrowing in the current fiscal year.

CHAPTER II. SIMULATIONS WITH THE CBO INTEREST MODEL

CBO's interest model is designed to produce budget estimates quickly under a variety of economic and fiscal policy assumptions. CBO projections of total borrowing from the public are consistent with its estimates of revenues, outlays, and off-budget spending. It projects the seasonal pattern of Treasury borrowing in detail for the current fiscal year. It uses preliminary monthly outlay and revenue estimates to calculate the approximate amount of deficits to be financed. Changes in cash balances are estimated using typical seasonal patterns, Treasury announcements of cash balance targets, and other information that may be available.

Generally, CBO assumes that the Treasury meets its cash balance target at the end of the current fiscal year and that the ending cash balance is the same in all subsequent years. (For example, CBO is currently assuming a cash balance of $20 billion at the end of 1984, down from $37 billion a year earlier.) Errors in the cash balance projection have little effect on interest estimates, since they usually translate into reduced (or increased) borrowing needs in the months immediately following. The change in checks outstanding is estimated primarily by examining the timing of weekends and holidays, which can cause a large volume of checks to be outstanding at the end of a month. Interest accrued but not yet paid is approximated by converting preliminary estimates of net interest costs to a cash basis. In general, CBO makes no explicit assumptions concerning IMF loans and repayments. For periods beyond the current fiscal year, a detailed projection of monthly borrowing requirements is impractical, and CBO's model uses fixed seasonal factors based on recent historical patterns.

Estimated borrowing requirements, along with projected interest rates, provide the data necessary to estimate federal interest costs. CBO's interest estimation model uses current information on the outstanding public debt (including amount, interest rate, and maturity date for each outstanding security) drawn from the Treasury's Monthly Statement of the Public Debt. Using these data, CBO computes interest costs on existing securities. The existing debt is increased by the amount of new borrowing, which is distributed among the months of the year and among different types of securities (bills, notes, and bonds) based on CBO's assumptions about seasonal borrowing needs. In general, any new borrowing in a given month is added proportionately to the existing debt issues maturing that

month. The entire amount is then combined into a single new issue and financed at the new-issue rate.

BASELINE INTEREST PROJECTIONS

Developed in early 1984, CBO's baseline budget projections show an increase in net interest outlays from an estimated $110 billion in 1984 to $217 billion in 1989 (see Table 7). These projections assume a continuation of the tax and spending policies in place at that time. With an average annual growth rate exceeding 14 percent, CBO projects that net interest will grow faster than any other category of spending, including defense and Medicare.

TABLE 7. FEBRUARY BASELINE NET INTEREST PROJECTIONS, 1984-1989 (In billions of dollars) a/

Subfunction	1984	1985	1986	1987	1988	1989
Interest on Public Debt	150.5	175.0	201.3	231.1	266.3	302.0
Interest Received by Certain Trust Funds	-19.2	-23.2	-28.8	-35.4	-42.9	-52.3
Other Interest						
Interest from off-budget agencies	-15.3	-18.7	-20.1	-21.3	-22.8	-24.2
Interest on tax refunds	1.5	1.4	1.2	1.2	1.2	1.2
Interest on tax and loan accounts	-0.9	-0.9	-0.9	-0.9	-0.8	-0.8
All other	-6.9	-7.9	-8.2	-7.7	-7.6	-8.9
Subtotal	-21.6	-26.2	-27.9	-28.7	-30.1	-32.7
Total	109.6	125.6	144.5	167.0	193.3	217.0

SOURCE: Congressional Budget Office.

a. Minus sign denotes offsetting receipt.

CBO projects that gross interest on the public debt (budget subfunction 901) will increase from about $150 billion in 1984 to over $300 billion in 1989, as the gross public debt grows from $1.4 trillion at the start of 1984 to almost $3.3 trillion at the end of 1989. Part of this growth will be offset by interest received by trust funds (budget subfunction 902), which CBO projects will increase from an estimated $19 billion received in 1984 to $52 billion in 1989. CBO estimates that the debt holdings of these trust funds, which account for the bulk of all government account holdings of federal debt, will grow from $196 billion at the start of 1984 to over $550 billion at the end of 1989, bolstered by the establishment of a military retirement trust fund in 1985. 1/ (See accompanying box for treatment of interest in the National Income and Product Accounts.)

The baseline interest projections reflect a modest decline in the average rate of interest on the outstanding debt, consistent with the assumed baseline interest rates on new borrowing shown in Table 8. The $1 trillion in marketable debt outstanding before the start of fiscal year 1984 carries an average rate of just over 10 percent in fiscal year 1989 (versus 10.8 percent at the start of fiscal year 1984), as a result of refinancing. The $1.5 trillion in additional debt borrowed in 1984-1989--almost all of it in marketables--is initially borrowed at rates averaging about 10 percent and, by 1989, carries an average rate of about 9.8 percent.

TABLE 8. FEBRUARY BASELINE INTEREST RATE ASSUMPTIONS ON NEW BORROWING a/ (SELECTED MATURITIES), 1984-1989 (Calendar year averages)

Type of Issue	1984	1985	1986	1987	1988	1989
91-Day Treasury Bills (Bank discount basis)	8.9	8.6	8.4	8.2	8.0	7.8
Three- to Five-Year Treasury Notes	11.1	10.7	10.5	10.5	10.4	10.2
Treasury Bonds	11.7	11.2	11.0	10.9	10.8	10.6

SOURCE: Congressional Budget Office.

a. Applied to new financing and refinancing.

1. For a listing of major trust funds included in subfunction 902, as well as other funds investing in federal debt, see the technical appendix.

NET INTEREST IN THE NATIONAL INCOME AND PRODUCT ACCOUNTS

The analysis in this paper focuses on net interest as defined in the federal government's unified budget. The budget defines net interest somewhat differently from the national income and product accounts (NIPA) used by economists. The two measures are, however, very close. In fiscal year 1983, for example, budget net interest totaled $89.8 billion, while the Commerce Department calculated NIPA net interest at $90.5 billion.

NIPA net interest focuses only on those transactions involving interest payments to, or receipts from, members of the public. It differs from budget net interest primarily in its treatment of certain programs--known as public enterprise and trust revolving funds--which carry on business-type operations with members of the public involving both outlays and collections. Examples of such funds include the Tennessee Valley Authority Fund and the FDIC fund. The budget assigns all outlays and collections to these funds, thereby excluding them from net interest. The NIPA, in contrast, splits out transactions involving interest payments or receipts and reflects them in net interest. The NIPA also excludes a number of intragovernmental interest receipts which are counted in budget net interest, since these do not reflect dealings with the public.

The NIPA also excludes interest payments on tax refunds and a portion of interest from states on unemployment insurance loans, both of which are included in budget net interest, treating these instead as an adjustment to federal sector receipts.

NIPA net interest has generally been slightly below budget net interest in the past, except in fiscal year 1983 (attributable mainly to the timing of a large intragovernmental interest payment), and CBO projects that this pattern will continue with minor variations. While very close to budget net interest, the NIPA measure is a somewhat superior measure of the federal government's borrowing costs. The most important determinant of interest costs--borrowing from the public--affects both measures identically.

TABLE 9. GROWTH IN OUTLAYS FOR NET INTEREST ON THE PUBLIC DEBT a/, 1984-1989, FEBRUARY BASELINE (In billions of dollars)

Outlays	1984	1985	1986	1987	1988	1989
1983 Outlays	111.5	111.5	111.5	111.5	111.5	111.5
Growth Resulting From:						
Marketable Debt						
Refinancing of Existing Debt	-0.5	-1.6	-3.6	-5.1	-6.5	-8.1
New Borrowing	18.1	38.9	60.9	84.6	111.0	138.8
Subtotal	17.6	37.4	57.3	79.5	104.5	130.7
Other	2.2	3.0	3.7	4.7	7.4	7.6
Total growth	19.7	40.3	60.9	84.2	111.9	138.2
Baseline Outlays	131.3	151.8	172.4	195.7	223.4	249.7

SOURCE: Congressional Budget Office.

a. Subfunction 901 (interest on public debt) and 902 (interest received by certain trust funds).

CBO projects that interest costs on savings bonds will increase markedly in 1988. Recent legislation authorized the sale of savings bonds with interest rates pegged to market rates of return on other Treasury securities. The Treasury has announced provisions for applying the variable-rate treatment to savings bonds sold under the old, fixed-rate regime if the bonds are held an additional five years after November, 1982. The variable-rate treatment will be applied to these bonds if the market-based rate exceeds the rate payable under the fixed-rate regime. CBO estimates that, under these provisions, outlays for savings bond interest will jump from $5.9 billion in 1987 to $7.9 billion in 1988 before declining to $7.2 billion in 1989.

The growth in outlays for interest on the public debt and interest received by certain trust funds after 1983 is analyzed further in Table 9. Outlays for the combined subfunctions--frequently termed net interest on

the public debt--will grow from about $112 billion in 1983 outlays to almost $250 billion in 1989 under CBO's February baseline projections, an increase of $138 billion. Because of the declining interest rates assumed in CBO's baseline, refinancing of the end-of-1983 marketable debt lowers interest outlays in each year, by amounts growing from $500 million in 1984 to $8.1 billion in 1989. Annual deficits of about $200 billion to $300 billion increase interest outlays by about $20 billion to $30 billion each year, culminating by 1989 in an increase of $139 billion over 1983 levels. "Other increases" over 1983 spending levels--growing from $2.2 billion in 1984 to $7.6 billion in 1989--are the result of changes in savings bond provisions, increases in interest paid to government accounts that are not included in subfunction 902 (but offset elsewhere in the budget), and a number of smaller factors.

The "other interest" category (subfunction 908) is projected to grow from net receipts of about $22 billion in 1984 to $33 billion in 1989 in CBO's February baseline, as shown in Table 7. This subfunction is dominated by interest receipts from off-budget agencies, primarily the Federal Financing Bank (FFB). FFB's loan portfolio is projected to increase from about $136 billion at the start of fiscal year 1984 to about $220 billion in 1989. The baseline assumes relatively stable outlays for interest on tax refunds paid by the Treasury 45 days or more after the filing date (projected to decline from $1.5 billion in 1984 to $1.2 billion in 1989), and interest earnings on the Treasury's cash balances in tax and loan accounts at commercial banks ($800-900 million in all years). The other programs in this subfunction, totaling net receipts of $7 to $9 billion in each year, consist of intragovernmental interest paid by other agencies to the Treasury, interest from states on loans from the federal unemployment insurance program, and several other programs. Timing variations cause some volatility in these categories.

Like any other model, CBO's approach for projecting net interest makes a number of simplifying assumptions. Its net interest projections also depend critically on the future course of interest rates and on tax and spending policies, which cannot be predicted accurately. CBO's models, however, are versatile enough to project net interest costs consistently for many alternative scenarios. Several such variations on CBO's February baseline projections are described below.

EFFECT OF HIGHER INTEREST RATES

Interest rates are one of the major sources of uncertainty in budget projections. CBO's net interest model readily projects the budgetary effects of alternative interest rate assumptions.

One-Percent Higher Interest Rates, 1984-1989

Higher (or lower) interest rates for government securities affect the interest costs on new borrowing and on existing debt that is being refinanced. CBO estimates that, if interest rates for all Treasury securities were one percentage point higher than the baseline beginning in January 1984, the federal budget deficit would be more than $2 billion higher in 1984, and almost $30 billion higher in 1989 (see Table 10).

The direct effects of higher interest rates on net interest outlays stem from higher costs on new borrowing and on refinanced debt. New borrowing in fiscal year 1984 is assumed to be about $188 billion in the base case, of which $36 billion had been accomplished before January 1984. Since on average the remaining borrowing occurs about halfway through the rest of the fiscal year, the additional interest costs on this debt are roughly one percent of $152 billion for four-and-one-half months, or about $0.6 billion. About $410 billion of marketable debt is also scheduled for refinancing at least once during the January to September period. Since some of this debt is in very short maturities, such as 91-day bills, refinancing on average occurs about three months into the year; additional interest costs on this debt are roughly 1 percent of $410 billion for five months, or about $1.9 billion.

The direct effects of higher interest rates also increase certain receipts included in other interest, such as interest on Federal Financing Bank loans and interest on Treasury cash balances. Aside from net interest, the major program affected by a change in interest rate assumptions is the Guaranteed Student Loan program. Federal revenues are also assumed to increase slightly with the change in interest rates, primarily as a result of higher deposits of earnings by the Federal Reserve. The sum of all of these direct (or first-round) effects of higher interest rates in turn increases the deficit and leads to additional borrowing, thus raising interest outlays by another $0.1 billion in 1984.

The direct and indirect effects of higher interest rates cumulate dramatically over time. According to CBO's February projections, from January 1984 to the end of 1989, about $1,460 billion in new debt will be added in the baseline, while about $830 billion of the pre-1984 marketable debt will be refinanced. The direct effect of higher interest rates in 1989 will grow to about $22 billion, while the indirect effect--reflecting cumulatively higher borrowing than in the base case--will be over $8 billion as shown in Table 10.

Interest rate forecasting has become a major source of uncertainty in budget projections. As the foregoing simulation shows, the size and rate of

TABLE 10. EFFECT ON FEBRUARY BASELINE PROJECTIONS OF ONE PERCENT HIGHER INTEREST RATES, 1984-1989 [a] (In billions of dollars)

	1984	1985	1986	1987	1988	1989
Outlays						
Net interest						
Caused directly by higher interest rates:						
Refinancing of existing debt	1.9	5.2	6.6	7.4	7.9	8.3
New borrowing	0.6	2.8	5.2	7.8	10.7	13.9
Savings bond valuation adjustment	b/	b/	b/	b/	2.1	0.9
Other interest (subfunction 908)	-0.1	-0.3	-0.5	-0.7	-0.9	-1.0
Subtotal	2.4	7.7	11.3	14.5	19.8	22.0
Caused by resulting increase in deficit	0.1	0.7	1.8	3.4	5.6	8.5
Subtotal, Net Interest	2.5	8.4	13.1	17.9	25.5	30.5
Other Outlays	0.2	0.3	0.4	0.4	0.4	0.4
Total, Outlays	2.7	8.7	13.5	18.3	25.9	30.9
Revenues	0.3	0.8	1.0	1.1	1.2	1.3
Deficit	2.4	7.9	12.5	17.2	24.6	29.6

SOURCE: Congressional Budget Office.

a. Starting January 1984.

b. No change in outlays.

growth of the debt are so large that even a relatively small forecasting error of one percentage point has enormous annual and cumulative implications. The simulation results shown in Table 10 assume no changes in CBO's other economic assumptions concerning growth, inflation, or unemployment. A large change in the interest rate forecast would almost certainly have macroeconomic consequences that would affect the level of federal revenues and transfer payments; no such feedback effects are included in Table 10. The relationships between interest rates and other economic variables, however, are sufficiently uncertain that most macroeconomic forecasts must be deemed compatible with a range of interest rate assumptions.

Alternative Interest Rate Assumptions

CBO's February baseline projections assume that short-term interest rates by the late 1980s will be just under 8 percent, exceeding the projected inflation rate by about 3.5 percentage points. But with continuing federal deficits of $200 billion or more, interest rates may be far higher. Table 11 summarizes the results of two plausible scenarios, illustrating how interest costs would be dramatically higher if large federal deficits or other factors caused interest rates to be higher than assumed in the baseline.

The first simulation in Table 11 shows the change in interest costs that would occur if nominal interest rates remained constant at their levels during the first quarter of calendar year 1984. As Table 11 shows, the deficit would differ only slightly from the baseline in 1984 but would diverge steadily in subsequent years, exceeding the baseline by $29 billion in 1989.

The second simulation shows the change in interest costs that would result if nominal interest rates rose during 1984-1989 in a pattern similar to other postwar recoveries. The available data indicate that by the twenty-eighth quarter following the recession's trough, short-term interest rates would be about two percentage points higher than their trough levels. (The increase in medium- and long-term rates is historically smaller, and leads to a more compressed yield curve.) This scenario is consistent with an increase in private credit demands during the recovery. The budget deficit would be about $1 billion higher than the baseline in 1984, growing to $39 billion by 1989.

The current recovery is, in fact, unlikely to resemble other postwar recoveries in several crucial respects. In particular, no previous postwar recovery has occurred in which total on- and off-budget deficits remained at five percent of GNP or more. Neither does this analysis take into account monetary policy, inflation, or other variables that also affect interest rates. Nevertheless, the illustrations in Table 11 further dramatize the interest rate risks confronting the federal budget.

TABLE 11. EFFECT OF ALTERNATIVE INTEREST RATE SCENARIOS ON FEBRUARY BASELINE PROJECTIONS, 1984-1989 a/
(In billions of dollars)

	1984	1985	1986	1987	1988	1989
Constant (84:I) Rates						
Outlays						
Net Interest						
Caused directly by higher interest rates	0.6	2.4	7.1	11.6	18.3	23.7
Caused by resulting increase in deficit	b/	0.2	0.7	1.8	3.6	6.3
Subtotal	0.6	2.6	7.8	13.4	21.9	30.0
Other outlays	b/	0.1	0.2	0.3	0.4	0.5
Total, Outlays	0.6	2.7	8.0	13.7	22.3	30.5
Revenues	0.1	0.3	0.7	1.0	1.2	1.5
Deficit	0.5	2.4	7.3	12.7	21.1	29.0
Cyclical Recovery Rates						
Outlays						
Net Interest						
Caused directly by higher interest rates	0.9	3.4	8.9	14.7	23.1	31.6
Caused by resulting increase in deficit	b/	0.3	1.0	2.3	4.7	8.4
Subtotal	0.9	3.7	9.9	17.0	27.8	40.0
Other outlays	0.1	0.2	0.4	0.5	0.7	0.9
Total, Outlays	1.0	3.9	10.3	17.5	28.5	40.9
Revenues	0.2	0.4	0.9	1.3	1.7	2.2
Deficit	0.8	3.5	9.4	16.2	26.8	38.7

SOURCE: Congressional Budget Office.

a. Starting January, 1984.

b. Less than $50 million.

EFFECT OF HIGHER DEFICITS

Both economic and policy uncertainties complicate the projection of future budget deficits. Since the deficit substantially determines federal government borrowing needs, these same uncertainties affect projections of future interest costs.

CBO is frequently asked to estimate the changes in interest outlays that would result from future changes in revenues or in non-interest spending (labeled a "shock"). Table 12 illustrates two such calculations.

TABLE 12. EFFECT OF $10 BILLION ADDITIONAL BORROWING ON FEBRUARY BASELINE PROJECTIONS, 1984-1989 (In billions of dollars)

Change in Deficit	1984	1985	1986	1987	1988	1989
	$10 Billion Shock in 1984 Only					
From Lower Revenues or Higher Non-interest Spending	10.0	a/	a/	a/	a/	a/
From Higher Interest Costs	0.4	1.2	1.3	1.4	1.5	1.6
Total	10.4	1.2	1.3	1.4	1.5	1.6
	$10 Billion Shock in 1984-1989					
From Lower Revenues or Higher Non-interest Spending	10.0	10.0	10.0	10.0	10.0	10.0
From Higher Interest Costs	0.4	1.7	2.9	4.2	5.6	7.2
Total	10.4	11.7	12.9	14.2	15.6	17.2

SOURCE: Congressional Budget Office.

a. None.

Estimating the interest effects (and hence, the total change in the deficit) that would result from changes in non-interest spending or revenues is conceptually simple though computationally complex. In the first year of the simulation, the exogenous spending or revenue change is assumed to increase (or diminish) the government's borrowing needs throughout the remainder of the year. On average, an additional dollar of debt is assumed to be financed halfway through the year or, in the case of a partially completed fiscal year, halfway through the remaining months. Multiplying by the assumed average interest rate yields an approximation of the first-year effect; the full effect--allowing for the compounding of interest costs--is estimated by using a formula for mathematical convergence. For subsequent years, the cumulative higher (or lower) deficits from earlier years are multiplied by their respective interest rates with adjustment for expected refinancing, while the interest effect of changes in the current year's borrowing requirements is again computed separately.

Table 12 illustrates this approach. The first illustration shows the effect on CBO's baseline projections of a $10 billion decrease in revenues or a $10 billion increase in non-interest spending in 1984 only. This $10 billion change, or shock, alone would cause $10 billion in additional borrowing during the remainder of fiscal year 1984, with the additional borrowing staggered through the remaining eight months of the fiscal year. The additional interest costs in 1984 would be approximately $10 billion times a 10.5 percent interest rate times an average of four months outstanding, for a total of $0.4 billion. The total increase in the 1984 deficit would be $10.4 billion, while the higher debt outstanding would raise interest costs in all subsequent years as well, by amounts growing from $1.2 billion in 1985 to $1.6 billion in 1989 through the effects of compounding.

The second illustration in Table 12 shows the effect of a $10 billion decrease in revenues or increase in non-interest outlays in each fiscal year from 1984 to 1989. In 1984, the effects would be identical to the first illustration. In 1985 and subsequent years, each year's $10 billion increase in exogenous borrowing would increase interest costs by about $0.5 billion in the first year and over $1 billion in all subsequent years. By the start of 1989, the additional debt would cumulate to $65 billion, causing interest outlays to be $6.7 billion higher in 1989, while the $10 billion shock in 1989--again staggered throughout the year--would raise interest outlays another $500 million, for a total increase of $7.2 billion.

Reductions in federal government borrowing have the opposite effects of those shown in Table 12. A $10 billion increase in revenues or decrease in non-interest spending in each year, for example, would lower interest outlays by amounts growing from $0.4 billion in 1984 to $7.2 billion in 1989--exactly the reverse of the illustration. The compounding of interest

effects from large shocks is so dramatic that most deficit reduction proposals include substantial interest savings that would result from the suggested revenue increases and/or spending reductions.

Table 12 also vividly illustrates the costs of delay in grappling with large deficits. Each year's deficit of $200 billion or so would permanently add roughly $20 billion to interest costs in future years. As time goes on, ever larger tax increases or non-interest spending cuts would be required to achieve a given deficit target.

EFFECT OF A CHANGE IN FINANCING MIX: SAVINGS BONDS VERSUS MARKETABLE SECURITIES

In financing the deficit, the Treasury relies primarily on the sale of marketable securities--bills, notes, and bonds--at auction. As the largest borrower in the debt markets, the Treasury regularly borrows in maturity ranges from three months to 30 years. The Treasury's marketable borrowing mix is governed by a number of considerations. In cooperation with a group of almost 40 firms known as primary dealers in government securities, the Treasury attempts to auction a mix of securities that will raise large amounts of cash efficiently while ensuring the maximum participation of investors with funds to lend.

During the past several years of high deficits, Treasury borrowing has kept the marketable debt at a ratio consisting of about one-third bills and two-thirds notes and bonds, though recently it has made a small shift to greater note and bond financing in an effort to lengthen the average maturity of the debt. CBO assumes a continuation of this marketable borrowing mix.

In estimating marketable borrowing requirements, the Treasury must project the cash inflows and outflows caused by sales and redemptions of nonmarketable debt, including savings bonds. In general, CBO assumes no net cash flow in savings bonds during the forecast period. As shown in Table 13, redemptions of savings bonds have exceeded cash sales during the last several years, though the pace of net redemptions has slowed. When savings bond redemptions exceed sales, Treasury marketable borrowing must increase to offset the cash outflow.

Savings bonds sold prior to November 1982 paid a fixed rate of interest depending on their holding period. In late 1982, the Treasury began offering market-based savings bonds with interest rates pegged to market yields on medium-term Treasury securities during the holding period. The purchaser must hold the savings bond for five years or more; after five years, the rate is 85 percent of the market yield on five-year Treasury marketable

TABLE 13. SALES, REDEMPTIONS, AND INTEREST INCREMENTS OF U.S. SAVINGS AND RETIREMENT PLAN SERIES, 1980-1983 (In billions of dollars)

Changes	1980	1981	1982	1983
Sales	5.4	4.1	3.8	4.7
Redemptions	-17.3	-13.1	-9.5	-6.8
Interest Increments	4.2	4.2	4.9	5.0
Debt Outstanding a/	73.3	68.5	67.8	70.8

SOURCE: Department of the Treasury.

a. In addition to savings bonds, includes savings notes and retirement plan bonds totaling about $500 million.

obligations since the savings bond was purchased. A minimum return of 7.5 percent is guaranteed. During the five-year holding period, the savings bond earns interest at successively higher rates as shown in Table 14. Interest accruals increase during each period to credit the higher interest rate over the entire holding period to date. Interest accruals on the most widely held bonds--Series E and EE bonds--are not paid out immediately to the owners but are instead added to the redemption value of the bonds.

Experience with the new market-based savings bonds is still too limited to permit a definitive conclusion as to whether the trend of net redemptions will be reversed. Because the return is only 85 percent of the rate available on other Treasury securities, and because the holding period is relatively long, CBO assumes that the new savings bonds will remain attractive primarily to small investors. CBO believes that its assumption of zero net cash flow from savings bonds is reasonable for budget projections. Net interest estimates, however, are sensitive to assumed sales of savings bonds. If sales of the new market-based bonds were $5 billion higher annually during fiscal years 1984-1989, net interest costs would be lower by amounts growing from $0.1 billion in 1984 to over $1 billion per year in 1987-1989, as shown in Table 15.

The direct savings to the government from additional savings bond financing occur mainly in the the first five years the bond is outstanding, when it accrues interest at low scheduled rates. (In contrast, marketable

TABLE 14. SCHEDULE OF INTEREST RATES ON SAVINGS BONDS SOLD ON OR AFTER NOVEMBER 1, 1982 (Selected months)

Months After Issue	Interest Rate From Issue Date to Start of Period a/
6	4.16
12	5.52
18	5.75
24	6.00
30	6.25
36	6.51
42	6.75
48	7.02
54	7.26
60	7.51 b/

SOURCE: Department of the Treasury.

a. Interest is paid by increasing the redemption value of the bond on the first day of each period.

b. This represents the guaranteed rate; the market-based rate (85 percent of average yield on five-year Treasury marketable obligations) is paid if it is higher than the guaranteed rate.

issues accrue interest at the same rate throughout their holding period). Even after the five-year holding requirement is met, the total interest earned on a savings bond is less than on a marketable issue because the yield to maturity of a savings bond is pegged to 85 percent of a comparable marketable rate. This rate differential is less advantageous to the government if the 7.5 percent guaranteed yield exceeds the market-based rate. Table 15 shows that the direct outlay reduction decreases in 1989 when the first crop of the additional savings bonds reaches the five-year threshold and is adjusted for market-based rates. A similar adjustment would occur in each subsequent year.

The indirect savings to the government from additional savings bond sales stem from lower total borrowing requirements. Total borrowing is less both because of the direct effect just described and because interest on the additional savings bonds is assumed to be accrued but not paid. While counting the additional accrued savings bond interest in total outlays, the

TABLE 15. EFFECT OF $5 BILLION HIGHER SAVINGS BOND SALES ON FEBRUARY BASELINE NET INTEREST COSTS, 1984-1989 a/ (In billions of dollars)

Change in Interest	1984	1985	1986	1987	1988	1989
Direct Effects						
Higher savings bond interest	0.1	0.3	0.6	1.0	1.5	2.4
Lower marketable interest	-0.2	-0.8	-1.3	-1.8	-2.4	-2.8
Subtotal	-0.1	-0.5	-0.7	-0.8	-0.8	-0.4
Indirect Effect						
Lower marketable interest from lower borrowing	b/	-0.1	-0.2	-0.4	-0.6	-0.9
Total Change in Interest Costs	-0.1	-0.5	-0.9	-1.2	-1.4	-1.3

SOURCE: Congressional Budget Office.

a. Starting January 1984.
b. Less than $50 million.

government in fact retains use of the money until the bond is presented for redemption. The increase in interest accrued but not paid becomes a component of the "other means of financing" as discussed in Chapter I.

UPDATING THE INTEREST PROJECTIONS: THE CBO AUGUST BASELINE

In the months following the release of CBO's February 1984 baseline projections, both legislative and economic developments dramatically affected the budget outlook for 1984 and beyond. Congress passed a series of measures, most notably the Deficit Reduction Act of 1984, designed to

increase revenues and reduce outlays relative to CBO's February baseline. Economic growth in early 1984, which exceeded the expectations of CBO and most other forecasters, contributed to higher revenues and lower spending for programs such as unemployment insurance. At the same time, interest rates climbed sharply from their levels of early 1984, raising outlays for net interest and other interest-sensitive programs.

CBO's August baseline portrays the current budget outlook after incorporating these new developments. 2/ Table 16 shows the change in CBO's net interest projections between the February and August baselines. Under the latest estimates, net interest outlays are higher in fiscal years 1984 to 1988 than had been projected in February, since the higher interest rate forecast outweighs other changes in the estimates. By fiscal year 1989, however, the effects of lower deficits in all years and other revisions to the February estimates would result in lower net interest outlays.

The higher interest rate assumptions contained in CBO's August forecast raise the baseline net interest estimates by amounts growing from $2.1 billion in 1984 to $16.2 billion in 1989, as shown in Table 16. CBO's August interest rate assumptions are detailed in Table 17. Interest rates for short-term Treasury bills are projected to be approximately one percentage point higher over the 1984-1989 period than was assumed in February. Medium- and longer-term interest rate assumptions are also significantly higher than in February, particularly in 1984 and 1985.

Legislative changes in federal government agricultural programs enacted in early 1984 will have a small effect on net interest costs. The legislation is projected to reduce the Commodity Credit Corporation's borrowing from the Treasury Department, thus resulting in smaller intragovernmental interest receipts, as shown in Table 16.

Technical changes in CBO's estimates result in small changes in the net interest projections for 1984 and 1985, with the changes becoming larger in 1986 through 1989. These changes result primarily from reestimating of CBO's models for projecting interest costs on savings bonds and interest costs on government account holdings of federal debt; they reflect newly available data and a reexamination of the relationships assumed in the models. Technical revisions to the other interest reestimates mainly reflect lower assumed lending by the Federal Financing Bank and changes in intragovernmental interest payments.

---

2. Congressional Budget Office, The Economic and Budget Outlook: An Update (August 1984).

TABLE 16. CHANGE IN NET INTEREST PROJECTIONS BETWEEN FEBRUARY AND AUGUST 1984 BASELINES, 1984-1989
(In billions of dollars)

	1984	1985	1986	1987	1988	1989
February Baseline	109.6	125.6	144.5	167.0	193.3	217.0
Effect of Higher Interest Rates						
Net interest on the public debt	2.3	12.1	12.7	12.1	15.8	16.9
Other interest	-0.2	-0.4	-0.4	-0.4	-0.5	-0.7
Subtotal	2.1	11.7	12.2	11.7	15.3	16.2
Effect of Legislative Actions [a/]						
Other Interest	b/	b/	b/	0.1	0.3	0.4
Effect of Technical Revisions						
Net interest on the public debt	b/	-0.7	-1.1	-1.6	-3.3	-3.8
Other interest	-0.4	0.9	0.1	b/	0.2	-0.4
Subtotal	-0.4	0.2	-1.0	-1.6	-3.1	-4.2
Effect of Lower Deficits						
Net interest on the public debt	-0.3	-3.9	-6.1	-8.6	-11.7	-15.6
Total Changes	1.5	7.9	5.1	1.7	0.8	-3.1
August Baseline	111.1	133.5	149.6	168.6	194.1	213.9
Addendum						
Debt Held by the Public, End of Year						
February Baseline	1,330	1,539	1,770	2,029	2,316	2,638
August Baseline	1,308	1,497	1,706	1,936	2,189	2,466

SOURCE: Congressional Budget Office.

a. Direct effect of the Agriculture Act of 1984 on intragovernmental interest costs (see text). The interest savings from lower borrowing attributable to enacted legislation, such as the Deficit Reduction Act, are included in the category labeled "effect of lower deficits".

b. Less than $50 million.

TABLE 17. AUGUST BASELINE INTEREST RATE ASSUMPTIONS ON NEW BORROWING [a] (SELECTED MATURITIES), 1984-1989 (Calendar year averages)

Type of Issue	1984	1985	1986	1987	1988	1989
91-Day Treasury Bills (Bank discount basis)	10.0	9.7	8.9	8.9	8.9	8.9
Three- to Five-Year Treasury Notes	12.6	11.7	10.8	10.8	10.8	10.8
Treasury Bonds	12.9	11.9	11.0	11.0	11.0	11.0

SOURCE: Congressional Budget Office.

a. Applied to new financing and refinancing.

Lower deficits over the entire 1984-1989 period, primarily resulting from deficit reduction measures enacted by the Congress, would lower the net interest projections by increasing amounts in each year. By 1989, the interest savings from lower borrowing would amount to more than $15 billion annually, as shown in Table 16. At the end of 1989, the debt held by the public would be almost $200 billion below the level projected in February.

This comparison of CBO's February and August estimates vividly illustrates the sensitivity of net interest estimates to economic and budget assumptions. In this case, a change in the interest rate forecast would increase outlays by billions of dollars over the 1984-1989 period, although changes in interest rate assumptions could, of course, operate in the opposite direction as well. By passing several deficit reduction measures, however, the Congress has succeeded in permanently reducing net interest outlays by more than $15 billion annually by the end of the decade.

APPENDIX

APPENDIX. TECHNICAL FEATURES OF THE CBO INTEREST MODEL

This appendix describes the technical aspects of CBO's methodology for projecting federal government net interest costs. As discussed in Chapter II, federal debt and interest costs contain a number of components that must be estimated separately. This appendix describes CBO's methods for projecting interest costs on public issues, interest costs on the government accounts series and the closely related interest received by trust funds, and outlays in the other interest category (subfunction 908).

INTEREST ON PUBLIC ISSUES

Public issues include the entire public debt except the government accounts series, which is not sold to the public (see Table 4 in Chapter I). They consist of the marketable public debt plus nonmarketable securities such as savings bonds, foreign series, and the state and local government series. Each type of debt is projected separately. Interest costs on all public issues are counted in the budget on an accrual basis.

Annual and Monthly Financing

The total increase in public issues in each fiscal year is assumed to equal total borrowing from the public. CBO estimates borrowing from the public based on its projections of the on- and off-budget deficits and assumptions about other means of financing.

CBO generally assumes that future borrowing from the public will take place entirely in marketable securities. Its estimates incorporate the most recent actual levels of nonmarketable public issues--savings bonds, state and local government series, and foreign series--and assume that these remain unchanged during the projections period. This assumption is varied occasionally when there is reason to expect net sales or redemptions of nonmarketable debt.

Total borrowing from the public is distributed throughout the year and among different types of marketable securities using factors that are reexamined regularly. For the baseline interest projections discussed in this paper, the assumed financing mix is 30 percent bills and 70 percent notes and bonds. This mix would gradually lengthen the average maturity of the

marketable debt, since at the start of 1984 the marketable debt consisted of about 33 percent bills and 67 percent notes and bonds. Lengthening the average maturity of the marketable debt is consistent with the Treasury Department's current strategy, which attempts to reduce the administrative burden and market disruption resulting from frequent auctions to refund maturing issues. Actual Treasury borrowing to date in 1984 has placed even greater weight on notes and bonds than assumed in CBO's projections, and this may lead to a further reexamination and revision of the assumed borrowing mix.

Borrowing is distributed monthly in CBO's model using seasonal factors. The factors used for the baseline net interest projections are shown in Table A-1. These were calculated using historical patterns, with particular emphasis placed on the high-deficit years 1982 and 1983, and adjusted for specific factors (such as debt ceiling interruptions) that are not projected to recur.

TABLE A-1. SEASONAL FACTORS FOR MARKETABLE BORROWING ASSUMED IN BASELINE

Month	Bills a/	Notes	Bonds	Total
October	.06	b/	.10	.03
November	.10	.13	.14	.12
December	.22	.09	c/	.12
January	.19	.01	.10	.08
February	.10	.14	.15	.13
March	.12	.10	c/	.09
April	-.12	.01	.10	-.02
May	b/	.14	.15	.10
June	-.06	.11	c/	.04
July	.12	.02	.10	.06
August	.13	.15	.16	.14
September	.13	.10	c/	.10
	1.00	1.00	1.00	1.00

SOURCE: Congressional Budget Office.

a. Includes issuance of cash management bills in December and January (assumed to mature in April and June).
b. Less than .01.
c. No bonds assumed to be issued.

The seasonal factors shown in Table A-1 are adjusted for actual experience during the current fiscal year. The model draws on computer data files that contain actual new borrowing for each expired month. The year-to-date discrepancy between actual and assumed borrowing for each type of security is calculated and allocated proportionately to the remaining months to achieve the assumed fiscal year total borrowing.

The CBO sometimes modifies the model's financing pattern for the current fiscal year when it is felt to be inaccurate, though the model assumptions would continue to be used for subsequent years. For example, information about the current year's pattern of revenues and outlays or Treasury announcements of financing plans may cause CBO to adjust the current year's borrowing projections.

Bills

The calculation of interest costs on Treasury bills starts by a reading of a computer data file that lists bills outstanding for the most recent expired month. This file contains the amount, maturity date, and interest rate for each security. The model calculates monthly interest costs for each security. If a bill matures during a given month, it is incremented by a share of that month's assumed new borrowing in bills, and the entire amount is then assigned a new interest rate and a new maturity date. The length of a bill is assumed to be unchanged--that is, a 91-day bill is assumed to be reissued as a 91-day bill while 182-day and 364-day bills are treated similarly. Cash management bills, however, are assumed to be blended with the regular bills maturing on the same date. These calculations are repeated for the entire 72-month projections period.

The monthly interest cost on a bill is defined as:

$$Int_i = A_i \times r_i \times (days/360)$$

where:

Int_i = interest cost on $bill_i$

A_i = face amount of $bill_i$ (amount paid to owner at maturity)

r_i = interest rate on $bill_i$ (bank discount basis)

days = days in month.

This formula reflects a financial market convention that calculates the interest rate and cost on a discount security as if a year contained 360 days. The formula is modified in the model when a bill matures during a given month; the cost is then based on the weighted average of the old and the new (reissue) rates, with the weights tied to the respective amounts and days outstanding.

Notes and Bonds

Like the model for bills, the calculation of interest costs on Treasury notes and bonds starts by a reading of a description of all notes and bonds outstanding for the most recent expired month. The model calculates the monthly interest costs for each security based on its amount and interest rate. New borrowing in notes and bonds is added to the securities maturing in that month, and the entire amount is then reissued at a new rate and a new maturity date. The length of the security is assumed to be unchanged when it is rolled over. If no securities mature in a given month, as is often the case with bonds, the model arbitrarily creates a new issue dated the 15th of the month. The model makes no adjustment for the fact that the computed issue or reissue date may be a weekend or holiday, even though new debt is, in fact, issued only on business days.

Interest costs on a coupon security in a given month are defined as:

$$Int_i = A_i \times r_i \times \frac{1}{12}$$

where:

Int_i = interest cost of note or $bond_i$

A_i = principal amount of note or $bond_i$

r_i = interest rate on note or $bond_i$ (yield-to-maturity basis).

Unlike Treasury bills, interest costs on notes and bonds do not depend on the number of days in the month. The above formula is modified when a note or bond is assumed to mature and be reissued during the month in question.

The interest rate used for these calculations is the yield to maturity listed in the Treasury's Monthly Statement of the Public Debt (M.S.P.D.). Financial markets use this interest rate to reflect the premium or discount that will be paid at maturity. (The premium or discount results because

the coupon interest rate set by the Treasury--usually to an even one-eighth percentage point--cannot precisely reflect market conditions on the auction date, so that the securities are not sold at par.) Using the yield to maturity creates a slight error in interest projections since Treasury in fact uses a different method for amortizing the premium or discount. The error, however, is small.

One simplifying assumption of CBO's model for estimating interest costs on marketable debt is its reliance on the M.S.P.D. to represent the actual debt outstanding. The M.S.P.D. contains no information about securities which were auctioned during the month in question but not scheduled for issue until early the next month. Occasionally, the amount of such securities can be large, especially when the last day of a quarter falls on a holiday or weekend. 1/ Adjusting the model to track auction results, however, would substantially complicate the model with only a small payoff in greater accuracy.

An Illustration: Marketable Interest Costs in February 1984

February 1984 was the first projections month for the baseline interest estimates described in this paper, which incorporated actual debt and interest costs through January 1984. Tracking the model's calculations for one month illustrates the assumptions needed to project interest costs and points out sources of error in the estimates.

Projected interest costs on marketable debt in February 1984 are summarized in Table A-2. The table vividly illustrates the churning that occurs among Treasury bills in any month. On each of the four Thursdays in February, a 91-day and 182-day bill totaling about $12 billion matured and were refinanced based on auctions held several days earlier. In addition, a cash management bill (originally issued in December) matured on February 2, and a 364-day bill matured on February 23. Based on seasonal borrowing assumptions, the model incremented each 91-day bill by $149 million at refinancing. The 182-day bills and the 364-day bill were incremented by $298 million and $597 million, respectively. The entire amount--old plus new debt--was then reissued at an assumed interest rate based on CBO's economic forecast. Interest costs on these reissued bills were added to the costs on $289.4 billion in outstanding bills that did not roll over in February, for total interest accruals of $2.5 billion.

---

1. For example, the public debt as of December 31, 1983, included about $8.1 billion of notes that matured that day and that were reissued--along with more than $7 billion in new cash--on January 3, 1984.

TABLE A-2. PROJECTED INTEREST OUTLAYS ON MARKETABLE ISSUES, FEBRUARY 1984 (In millions of dollars)

	Amount		Interest Rate		
	Original	Projected Reissue	Original	Projected Reissue	Projected Interest Costs
Bills					
Not Refinanced	289,374	a/	9.01	a/	2,101
New Financing/ Refinancing					
February 2	3,514	6,165	8.41	8.80	42
	2,502 b/	--	8.73	--	1
	6,290	6,588	9.56	8.90	47
February 9	6,219	6,368	8.83	8.80	45
	6,246	6,544	9.70	8.90	47
February 16	6,241	6,390	8.78	8.80	45
	6,265	6,563	9.55	8.90	48
February 23	6,224	6,373	8.81	8.80	44
	6,242	6,540	9.29	8.90	47
	7,768	8,365	8.31	9.10	54
Subtotal					2,521
Notes					
Not Refinanced	583,193	a/	11.57	a/	5,623
New Financing/ Refinancing					
February 15	8,438	25,567	7.27	11.20	135
February 29	5,950	5,950	15.21	11.20	72
Subtotal					5,830
Bonds					
Not Refinanced	137,411	a/	10.18	a/	1,166
New Financing/ Refinancing					
February 15	c/	2,825	c/	11.80	13
Subtotal					1,178
Total					
Not Refinanced					8,890
New Financing/ Refinancing					640
Total					9,530

SOURCE: Congressional Budget Office.

a. No refinancing during month.

b. Cash management bill; blended with 91-day bill at maturity.

c. No bonds maturing during month.

Note and bond interest projections for February 1984 were simpler as a result of a much lower level of refinancing activity. In February, $14.4 billion in Treasury notes matured; based on seasonal borrowing assumptions, the model incremented these notes to raise $17.1 billion in new cash and reissued them at the assumed interest rate. 2/ About $2.8 billion in bond financing was also assumed. Since no bonds matured in February, the model created a new bond, assumed to be issued on the 15th. The interest costs on notes and bonds financed or refinanced in February were added to the costs on the debt not rolling over--$583.2 and $137.4 billion, respectively--to arrive at total interest costs.

As shown in Table A-2, projected interest costs on marketable debt totaled $9,530 million in February 1984. Unofficial Treasury Department data put the actual marketable interest costs in that month at $9,505 million. The error of $25 million--about 0.2 percent--is attributable to the two primary sources of model uncertainty: interest rates and borrowing patterns.

Interest rates were slightly higher in February than was assumed for the projections, causing outlays to be underestimated by about $5 million. This was more than offset, however, by errors in the borrowing projections. Actual marketable debt outstanding at the end of February was about $4 billion lower than assumed in the projections, and the mix and timing of this borrowing were also slightly different from the model's assumptions.

These two sources of error differ in their effect on interest projections. Overestimates (or underestimates) of borrowing are frequently offset in subsequent months, but errors in the interest rate forecast affect interest estimates for as long as the new debt is outstanding.

Analysis of Errors in Marketable Interest Projections, 1983

One can gauge the validity of CBO's model for projecting interest costs on marketable debt by examining its prediction record for a recently completed period. This section examines the model's predictions of monthly

---

2. CBO's model currently adds all net new cash in a given month to the first note maturing in that month--in this case, to the note maturing February 15. This assumption may be changed to improve the intramonthly borrowing pattern.

interest costs during 1983, which were based on CBO's February 1983 baseline budget and economic assumptions. 3/

Table A-3 compares the projected and actual outlays for interest on marketable debt for the 12 months starting in January 1983. The total prediction error is divided into errors caused by inaccurate interest rate assumptions, inaccurate borrowing assumptions, and other factors.

As shown in Table A-3, actual interest costs on marketable debt exceeded CBO's February 1983 baseline projections by a total of $2.8 billion in fiscal year 1983 and $5.1 billion in calendar year 1983. The misestimates were almost entirely the result of inaccurate interest rate forecasts. Short- and long-term interest rates averaged almost two percentage points higher in 1983 than CBO had assumed in its February 1983 forecast. Inaccurate interest rate assumptions caused interest costs on the marketable debt to be underestimated by $2.7 billion in fiscal 1983 and $5.1 billion in calendar year 1983.

Errors in the borrowing projections also caused marketable interest costs to be misestimated. This category includes inaccurate assumptions about deficits, cash balances, financing mix, and the seasonality of Treasury borrowing. Although the actual 1983 on- and off-budget deficits fell below CBO's February 1983 baseline projections, a huge buildup in Treasury cash balances caused fiscal year 1983 borrowing to be even higher than projected. These high cash balances, however, permitted a dramatic slowdown in borrowing in the October-December quarter. As shown in Table A-3, inaccurate forecasts of Treasury borrowing caused interest costs on marketable debt to be underestimated by $228 million in fiscal year 1983 but overestimated by $13 million in calendar year 1983.

The final category of misestimates, labeled "other" in Table A-3, measures the technical error in CBO's model for projecting marketable interest costs. Even with correct assumptions about monthly borrowing and average interest rates, small errors remain in the projections. The major sources of these errors are inaccurate assumptions about the intramonthly pattern of borrowing, use of the M.S.P.D.'s yield-to-maturity rate in place of the Treasury's method for amortizing the premium or discount, and other factors. This category of error is very small, causing interest outlays to be overestimated by $53 million in fiscal year 1983 and $66 million in calendar year 1983--less than 0.1 percent of total interest costs.

---

3. For more information about these economic and budget assumptions, see Congressional Budget Office, Baseline Budget Projections for Fiscal Years 1984-1988 (February 1983).

TABLE A-3. PROJECTED VERSUS ACTUAL INTEREST OUTLAYS ON MARKETABLE DEBT, 1983
(In millions of dollars)

	Monthly Outlays			Differences Because of		
	Projected	Actual a/	Difference	Interest Rates	Borrowing	Other
Fiscal Year 1983 Through December	23,951	23,951	b/	b/	b/	b/
Projections						
January	8,092	8,087	-5	15	-11	-9
February	7,827	7,824	-3	53	-9	-47
March	8,055	8,215	160	112	22	26
April	8,069	8,281	212	175	20	17
May	8,138	8,357	219	260	-4	-37
June	8,038	8,426	388	327	33	28
July	8,123	8,676	553	442	106	5
August	8,202	8,820	618	591	58	-31
September	8,172	8,878	706	698	13	-5
October	8,321	9,108	787	791	-8	4
November	8,391	9,077	686	811	-68	-57
December	8,610	9,359	749	874	-165	40
Fiscal Year 1983	96,667	99,515	2,848	2,673	228	-53
Calendar Year 1983	98,038	103,108	5,070	5,149	-13	-66

SOURCE: Congressional Budget Office.

a. Calculated by CBO based on unpublished Treasury Department information.
b. None; actuals incorporated in baseline.

Savings Bonds

Interest costs on savings bonds sold before and after November 1, 1982 are projected separately since these bonds are treated differently under the Treasury's new market-based calculations.

Savings bonds purchased before November 1, 1982 are assumed to continue earning interest at their contractual rate through October 1987. These bonds earn interest every six months depending on their original purchase date. During the period from November 1987 through April 1988, the model calculates whether these bonds would benefit from being credited with a market-based rate (85 percent of the average Treasury five-year note rate) instead of the contractual rate for the preceding five years. If so, a one-time adjustment to the value of these bonds is made and included in interest costs, and they are subsequently assumed to continue earning interest at the market-based rate.

Savings bonds sold starting in November 1982 are automatically subject to the market-based calculation after they have been held for five years. (A minimum yield of 7.5 percent, however, is guaranteed.) The model calculates this adjustment five years after the issue month and includes it in interest accruals for that month. Unlike the sudden adjustment to the stock of pre-November 1982 bonds that occurs in fiscal year 1988, this adjustment takes place gradually as bonds sold after that date reach the five-year threshold.

State and Local Government Series

The state and local government series (SLGs) consists of special nonmarketable securities issued to state and local governments in conjunction with the Treasury's tax regulation responsibilities. Interest income on state and local government securities is exempt from federal income tax (and generally exempt from income tax in the issuing jurisdiction). This allows state and local governments to borrow at lower rates than other borrowers. It also creates opportunities, however, for abuse of the tax-exemption privilege--for example, by borrowing money at tax-exempt rates and reinvesting it at higher rates. To prevent such abuses, Treasury requires that, under certain circumstances, the proceeds of state and local government borrowing be deposited with the Treasury in the form of SLGs. This practice constitutes a relatively low-cost source of funds to the Treasury, since the interest rates on SLGs are pegged to state and local governments' borrowing rates.

CBO projects interest costs on SLGs in the aggregate since the M.S.P.D. contains little detail on their composition. Monthly outlays are

estimated using the formula for coupon securities--that is, total SLGs outstanding are multiplied by the average interest rate and divided by twelve. Generally, no change in the amount and average interest rate of SLGs outstanding is assumed, although this has recently been a fast-growing category of debt. The simplifying assumption that the average interest rate will not change--in the absence of changes in SLGs outstanding--does not significantly bias the estimates, since SLGs are almost entirely in long maturities and redemptions occur slowly. If new SLGs are issued, they are assumed to carry an interest rate equal to 75 percent of the comparable Treasury rate, reflecting the tax-exempt status of state and local government borrowing.

Foreign Series

The foreign series are nonmarketable securities issued to foreign governments and, occasionally, to foreign private lenders. The securities issued to foreign governments are denominated in dollars, while those sold to private investors are denominated in foreign currency. Dollar-denominated securities are sold to foreign official institutions that have acquired dollars through their foreign exchange operations (for example, by purchasing dollars to avoid unwanted appreciation of their own currencies). The foreign government series has declined from almost $27 billion in 1973 to about $10 billion today. 4/ Several issues denominated in foreign currency were sold to members of the European public in the late 1970s and early 1980 during a period when the dollar was weak; all are now paid off.

CBO maintains computer data files listing individual foreign series securities by amount, maturity date, and rate. When the M.S.P.D. does not show the interest rate, CBO estimates it from the closest Treasury marketable auction. Interest costs are estimated by the same formula used for coupon securities. A small error results since some of the foreign series are discount securities (bills) and should be estimated using that formula, but the error is negligible.

---

4. At the same time, foreign holdings of Treasury marketable debt have increased dramatically since the early 1970s. The Treasury estimates that total foreign holdings of federal debt--marketable and nonmarketable--increased from $59 billion at the end of fiscal year 1973 to $160 billion at the end of 1983.

Adjusting Interest Costs on Public Issues for Alternative Deficits

CBO is often asked to estimate interest costs under alternative revenue or outlay paths when there is little time or justification for performing a full-blown interest model simulation. An example of this is the interest impact of hypothetical $10 billion changes in revenues or non-interest outlays (discussed in Chapter II). CBO has developed an auxiliary model that adjusts previously estimated interest costs for a change in assumed revenues or non-interest outlays.

This model utilizes the mathematical properties of interest compounding. An exogenous deficit shock in the first year--for example, a loss in revenues or increase in non-interest outlays--causes an increase in borrowing and in interest costs. The shock is assumed to be spread evenly over the year, on average occurring halfway through the year. The higher interest costs, in turn, add to the amount of the deficit that must be financed. Mathematically this may be approximated as:

$$\Delta Int_1 = (S_1 \times r_1 \times .5) + (S_1 \times r_1 \times .5)(r_1 \times .5) + (S_1 \times r_1 \times .5)(r_1 \times .5)^2 + \ldots$$

where:

ΔInt_1 = change in interest costs in year 1

S_1 = shock in year 1 (that is, change in assumed revenues or non-interest outlays)

r_1 = interest rate on new borrowing in year 1 (weighted average of bills, notes and bonds).

This formula converges to:

$$\Delta Int_1 = (S_1 \times r_1 \times .5) \times \frac{1}{1-(r_1 \times .5)}$$

and the total change in the deficit is:

$$\Delta Def_1 = S_1 + \Delta Int_1.$$

For subsequent years, the calculation is more complex. The additional interest costs are determined by the accumulation of additional debt from

earlier years as well as the current year's shock. The earlier years' debt, in turn, may be subject to refinancing. A mathematical representation is:

$$\Delta Int_T = \left[\left(\sum_{t=1}^{T-1} \Delta Def_t \times r_{t,T} \right) + (S_T \times r_T \times .5) \right] \times \frac{1}{1-(r_T \times .5)}$$

where:

ΔInt_T = change in interest costs in year T

ΔDef_t = total change in deficit, year t ($t < T$)

$r_{t,T}$ = interest rate in year T on debt added in year t (with adjustment for expected refinancing)

S_T = shock in year T

r_T = interest rate on new borrowing in year T.

This representation simplifies CBO's model slightly. The CBO model contains more detailed assumptions about the intrayear pattern of financing, and uses an adjustment when part of the first year is elapsed.

This auxiliary model can be used only for exogenous revenue or outlay changes and cannot be used for estimating the effects of interest rate changes. A change in the interest rate assumptions affects the existing debt as well as the new debt, while the calculations just described reflect only new debt. A change in the interest rate assumptions requires a full run of the larger interest model.

INTEREST ON THE GOVERNMENT ACCOUNTS SERIES AND INTEREST RECEIVED BY TRUST FUNDS

Government accounts held over $240 billion of the gross federal debt at the end of 1983 (see Table 1 in Chapter I). Budget subfunction 901 (interest on the public debt) includes interest outlays on the government accounts series, issued only to these funds. The bulk of these outlays are directly offset in subfunction 902, interest received by certain trust funds. The two are so closely related that a single model estimates both.

Change in Debt Holdings

The annual changes in debt holdings by the government accounts included in subfunctions 901 and 902 are estimated by totaling CBO estimates of receipts and outgo for the funds listed in Table A-4. These funds currently hold over 98 percent of all government account holdings of federal debt.

The monthly changes in debt holdings are estimated using typical seasonal factors. These factors show large increases in trust fund holdings in June and December, when large interest payments are rolled over into new purchases, and in September, when a lump-sum transfer (currently about $15 billion) is made from the general fund to the civil service retirement trust fund. Other months' changes are less predictable.

TABLE A-4. MAJOR GOVERNMENT ACCOUNTS INVESTING IN FEDERAL DEBT

Trust Funds in Subfunction 902	Government Accounts in Subfunction 901
Social Security (OASI and DI)	All trust funds in subfunction 902 plus:
Medicare (HI and SMI)	FDIC
Railroad Retirement	Employees health benefits
Civil Service Retirement	Employees life insurance
Foreign Service Retirement	FHA fund
Military Retirement a/	GNMA funds
Other Federal Employee Retirement Trust Funds	Exchange Stabilization Fund
Unemployment Trust Fund	FSLIC
Veterans' Insurance Trust Funds	Outer Continental Shelf escrow funds
Highway Trust Fund	Treasury deposit funds
Airport and Airways Trust Fund	Postal Service Fund
Hazardous Substances Response Fund	

SOURCE: Congressional Budget Office, based on Treasury Department information.

a. Starting in fiscal year 1985.

Interest Outlays

In contrast to public issues, interest payments on the government accounts series and interest received by trust funds are recorded in the budget on a cash basis. Interest payments are clustered on a few dates, such as June 30 and December 31, determined by the coupon dates of the securities held by these funds. In addition, however, these funds routinely redeem (and purchase) securities according to their cash flow needs. When redeeming a security, the fund also receives the interest accrued since the last coupon date.

CBO's model for projecting interest on government accounts and interest received by trust funds estimates accrued interest and then converts to a cash basis. The model generates separate estimates for three types of debt:

- Holdings of government accounts series by trust funds included in subfunction 902;
- Holdings of government accounts series by funds included in subfunction 901 but not in 902; and
- The small holdings of agency and marketable debt (currently about $4 billion) by trust funds included in 902.

Interest accruals for each category of debt are calculated by averaging the start- and end-of-month debt holdings, adjusting by a factor to estimate average daily holdings, and multiplying by an interest rate. The interest rate is projected by adjusting the last available actual rate for rollovers and new purchases of debt, which generally carry interest rates pegged to Treasury marketable yields. Accrued interest is converted to a cash basis using factors for coupon dates and expected early redemptions. The subfunction totals are then calculated by adding the appropriate categories of debt.

OTHER INTEREST

Budget subfunction 908, Other Interest, includes interest payments on tax refunds and, as offsets, various interest receipts from federal agencies and the public. The concluding section of this appendix describes CBO's methodology for estimating the major components of Other Interest--interest from off-budget agencies, interest on Internal Revenue Service refunds, interest on tax and loan accounts, Treasury intragovernmental interest, interest received from outer continental shelf escrow accounts,

interest on unemployment insurance loans to states, and Treasury proprietary interest. Together, these budget accounts represent -$20.7 billion out of the -$21.6 billion in Other Interest projected for 1984.

Interest From Off-budget Agencies

The largest component of Other Interest is Treasury interest receipts from two off-budget federal agencies: the Federal Financing Bank (FFB) and the Rural Telephone Bank. Of these, FFB interest payments are far more important, accounting for $15.2 billion of the $15.3 billion in interest from off-budget agencies expected in fiscal year 1984.

The FFB is an office in the Treasury created in 1973 to consolidate borrowing by other federal agencies. The FFB does not operate programs itself; rather, it finances other federal government programs by purchasing their debt securities, making loans on their behalf, or purchasing loans that they have extended. The FFB finances its activities by borrowing from the Treasury and pays interest on its borrowing. The drafters of the legislation originally anticipated that the FFB would issue its own debt (limited by Congress to $15 billion). Instead, the FFB has taken advantage of a provision allowing unlimited borrowing from the Treasury. FFB holdings, as shown in Table A-5, stood at $136.1 billion at the beginning of fiscal year 1984. Roughly 90 percent of the outstanding borrowing from the FFB has been used by agencies to fund federal lending programs such as foreign military sales, rural development, electrification and housing. Since the FFB is an off-budget agency, its financing of credit programs converts some on-budget loans into off-budget outlays. [5]

The FFB and the borrowing agency determine the size, maturity, and schedule of interest payments for an agency loan. Once the terms of a loan are decided, the FFB charges the initiating agency an interest rate equal to the Treasury's plus one-eighth of one percent. The FFB uses this one-eighth point to pay its operating costs and it transfers its remaining surplus to the Treasury.

---

5. Loan assets and guaranteed direct loans held by the FFB are used exclusively to finance federal credit programs. Federal accounting rules treat the FFB's purchase of these loans as a repayment to the agency thereby transferring the loan to the off-budget FFB. The Export-Import Bank also sells agency debt to the FFB to finance its lending activities. Accounting rules do not treat the sale of agency debt as a repayment of agency loans, however, so Export-Import Bank loans remain on-budget.

TABLE A-5. FEDERAL FINANCING BANK HOLDINGS, SEPTEMBER 30, 1983 (In billions of dollars)

Agency Debt	
Export-Import Bank	14.7
Tennessee Valley Authority	13.1
Other	1.3
Subtotal	29.1
Loan Assets	
Farmers Home Administration	56.7
Rural Electrification Administration	3.5
Other	0.3
Subtotal	60.5
Direct Loans to Guaranteed Borrowers	
REA Guaranteed Loans to Rural Electric Cooperatives	18.9
DoD Guaranteed Loans for Foreign Military Sales	14.3
Other	13.3
Subtotal	46.5
Total	136.1

SOURCE: Department of the Treasury.

CBO has adapted a model developed by the Office of Management and Budget (OMB) to project FFB interest receipts and payments to the Treasury for the current fiscal year and five future years. The model involves three main steps: calculating accrued interest on loans outstanding at the beginning of the current fiscal year, calculating accrued interest on new loans and applying principal repayments to balances, and converting accrued interest payments into cash payments. The methods for calculating both FFB interest receipts from agencies and FFB interest payments to the Treasury are identical except that the interest rate charged to the agencies is 0.125 points higher than that paid to the Treasury. The model uses data aggregated at the level of 33 loan programs, though these loan programs have generated thousands of individual loans that have been financed by the FFB over the last 10 years.

Accrued Interest on Existing Loans. For about 90 percent of outstanding loans, the FFB makes available to CBO a schedule of interest

and principal repayments. CBO's projection of future accrued interest on these loans is taken directly from this schedule. Because the FFB does not yet have the remaining 10 percent of loans entered in its computer system, CBO calculates interest payments for the remaining accounts (unscheduled balances) by multiplying loan balances by FFB's average return on its existing portfolio.

Accrued Interest on New Loans. CBO estimates accrued interest on loans made during the current and five future fiscal years by multiplying estimates of new lending less loan repayments by the projected average interest rate for Treasury bonds. The bond interest rate is used because the FFB's portfolio consists largely of investments with 10 to 25 year maturities. 6/ Since new lending is assumed to occur halfway through the fiscal year, only half the first year's interest is included for new lending. These new loans are added to the loans outstanding at the start of the simulation. Repayments of principal not earmarked to pay off existing loans are applied evenly to the new loans.

Converting Accrued Interest Into Cash Payments. Both because of the timing of loans and because interest payments may be scheduled on an annual, semi-annual, or quarterly basis, interest is not completely paid during the fiscal year in which it is accrued. In order to calculate cash interest receipts and payments, the accrued interest for each program in each year is multiplied by an accrual-to-cash ratio based on historical data. Accrued interest from the year prior to the current fiscal year is a part of cash interest in the current year.

Interest on IRS Refunds

The Internal Revenue Service (IRS) pays interest on tax refunds held more than 45 days past the legal filing date or in cases where an amended return shows that past tax payments were too high. Because corporations can carry back current losses and apply them against taxable income in past years, the bulk of IRS interest payments are paid on corporate refunds. In 1983, corporations received roughly two-thirds of interest payments. Predicting the level of IRS interest payments is difficult not only because of the fluctuating levels of corporate profits and losses but also because of frequent changes in tax law. The Congress, for example, changed laws governing the carry back of corporate losses in both 1981 and 1982. The

---

6. A possible improvement in the model would be to have different maturity assumptions for different lending programs.

recession and changes in tax law are the main reasons why interest on IRS refunds rose from $1.0 billion in fiscal year 1981 to $1.9 billion in 1983, and is expected to decline to $1.5 billion in 1984.

CBO estimates interest on IRS refunds based on income tax refund levels and interest rates that are consistent with CBO projections. Interest on refunds equals the predicted interest rate multiplied by the product of the volume of refunds and the probability that a refund is eligible for interest. The two main steps in the model are calculating effective interest rates and estimating interest paid on refunds.

Interest Rates on Refunds. The interest rate on tax refunds is determined by a formula specified in law. The rate for January through June is equal to the average prime rate for the preceding April through September, rounded to the nearest whole number. Similarly, the statutory interest rate for July through December is based on the average rate for the preceding October through March. Because many refunds eligible for interest are from taxes paid two to three years earlier, CBO's model calculates effective interest rates from a rolling average of the projected statutory rates.

Interest on Refunds. CBO projects interest on IRS refunds using separate equations for corporate and individual refunds. Projected interest on corporate refunds in a given quarter is simply a constant plus the product of a coefficient multiplied by corporate refunds and the effective interest rate for corporate refunds in that quarter. The coefficient represents the probability that the corporate refund is eligible for interest and is based on regression analysis of historical data. Interest on individual returns is estimated in the same manner using quarterly individual refunds and the effective interest rate for individual refunds. The equation for individual refunds uses different coefficients for each quarter since refunds made in the third and fourth quarter of the calendar year are more likely to receive interest.

Interest on Tax and Loan Accounts

The bulk of Treasury cash balances are held in interest-bearing accounts, called tax and loan accounts, at commercial banks around the country. Employers and others who make recurring payments to the Treasury--such as withheld income and social insurance taxes--typically deposit them directly in an authorized financial institution, which credits them to the Treasury's account. Funds are transferred as needed to the Treasury's account at the Federal Reserve, on which all government checks are drawn. Balances in the tax and loan accounts are highly volatile. In fiscal year 1983, they ranged from a low of $861 million to a high of $20,601

million, and averaged about $10.8 billion. Interest received in 1983 totaled $970 million.

CBO estimates interest on tax and loan accounts based on its cash balance and interest rate projections. Cash balances are projected consistent with the assumptions used for estimating public debt interest, which allow for seasonal variations in cash balances and an explicit end-of-year cash target. Total cash balances are adjusted by the $3 billion to $5 billion generally held in the Treasury's account at the Federal Reserve to estimate the assumed tax and loan account balances. Accrued interest is estimated by multiplying the assumed average balance times the projected federal funds rate, and is converted to cash interest receipts based on historical patterns.

Treasury Intragovernmental Interest

The Congress allows certain federal agencies to borrow directly from the Treasury to finance parts of their program costs. This "borrowing authority" is conferred either through permanent authorizing language or through budget appropriations. The Treasury and the individual agencies decide on the terms of the loan, taking into account the needs of the program being financed. These agency borrowings include both long and short term debt, with the interest rate determined by Treasury's own borrowing cost.

Intragovernmental interest payments to the Treasury are a substantial cost for many federal agencies, especially the Commodity Credit Corporation, the Farmer's Home Administration, and the Government National Mortgage Association. These three agencies accounted for $5.6 billion of the $6.6 billion in intragovernmental interest paid to the Treasury in fiscal year 1983.

Intragovernmental interest payments to the Treasury are counted as an agency outlay in the appropriate budget function and as an offsetting receipt in subfunction 908 (Other Interest.) Because the Treasury receipts merely offset outlays in individual programs, there is no single CBO model for intragovernmental interest. Agency interest payments are calculated using CBO's interest rate forecast and assumptions on outstanding debt and the future pattern of agency borrowing and repayments. As long as the amount of the interest receipt in subfunction 908 is identical to the amount of the interest outlay in the paying function, any estimating error will have no effect on the budget totals.

Interest Received from Outer Continental Shelf Escrow Accounts

The federal government and six oil and gas producing states are currently involved in litigation over receipts from the leasing of outer continental shelf mineral tracts. 7/ The suits stem from a 1978 federal law requiring a "fair and equitable" division with states of receipts collected by the federal government from the leasing of tracts within three miles of state waters. The disputed funds remain in interest-bearing escrow accounts invested in Treasury bills pending the outcome of suits with the six states. At the beginning of the 1984 fiscal year, the escrow accounts totaled $4.2 billion in principal and $1.4 billion in interest. When interest portions of the escrow account are released, the federal share will be counted as an interest receipt.

CBO projects accrued interest for the escrow account by multiplying each state's share of the existing principal and interest by CBO's interest rate for three-month Treasury bills up until the assumed settlement date for each state suit. The federal government's receipt of the interest depends on the date of settlement and the division of the disputed funds between the federal government and the states. CBO currently assumes that the largest cases will be settled in 1986 and 1989, and that the federal government will be awarded one-half of the escrow principal and interest. 8/

Interest on Unemployment Insurance Loans to States

Regular unemployment benefits are financed through state taxes paid into the federal unemployment insurance trust fund. When a state's share of the fund is exhausted, benefits are paid with loans from either the trust fund or general revenues. In order to encourage states to keep their funds solvent, the Congress passed a law requiring states to pay interest on their borrowings made after March 1982. The interest rate charged to states is based on the average interest earned by the trust fund in the final quarter of the previous calendar year, up to a maximum interest rate of 10 percent. There is no interest charge on loans repaid in the same fiscal year as they took place.

---

7. The six states are Alaska, Alabama, California, Louisiana, Mississippi, and Texas.

8. In February 1984, a federal judge ruled that Texas must receive one-half of the escrow funds in Texas tracts. The federal government is expected to appeal the decision.

In tax law changes made in 1982 and 1983, the Congress provided that states could defer their interest payments over a period of four to five years if states had high unemployment or acted to reduce unemployment benefits or increase taxes. States attempting to improve fund solvency are also charged an interest rate that is one percent lower than they would otherwise pay. There is a penalty if a state taking advantage of these provisions lowers unemployment taxes or increases benefits.

Outstanding state borrowing was $13.3 billion at the end of April 1984. Of this amount, $7.2 billion represented loans made after March 1982 which are accruing interest. Actual interest payments in fiscal year 1984 are expected to be about $374 million.

Treasury Proprietary Interest

Treasury proprietary interest consists of a large number of programs that have little in common except that they involve payment of interest by outsiders to the Treasury. The largest of these interest payments are made by the International Monetary Fund (IMF) and the District of Columbia.

The IMF pays interest to the Treasury for the U.S. investment in the fund, also known as its quota, and for loans made to the IMF by the Treasury. The IMF pays an interest rate based on a weighted average of three-month Treasury bills or notes issued by the United States, Germany, France, and Britain, and two-month bills issued by Japan. Until recently the interest rate was set at 85 percent of the weighted average; this percentage is now scheduled to increase gradually to 95 percent of the average by May 1986. In fiscal year 1983, the Treasury received $345 million in interest on the IMF quota and $140 million in interest on loans to the IMF.

The District of Columbia borrows from the Treasury to finance its long-term capital projects. This relationship with the Treasury stems from a period prior to 1974 when the District government was a federal agency. The District was allowed to continue to fund capital needs with Treasury borrowing in order to avoid disrupting existing projects. The interest rate paid to the Treasury is based on the Treasury's cost for debt of similar length. At the beginning of fiscal year 1984 the level of outstanding debt was $1.8 billion. The District's interest payments to the Treasury are expected to be $151 million in 1984. The Reagan Administration and the District government have both proposed that the District begin borrowing directly in the market in fiscal year 1985.

U.S. GOVERNMENT PRINTING OFFICE : 1984 O - 38-555